

The MINING CONGRESS JOURNAL

Volume 12

DECEMBER, 1926

Number 12



30 prominent builders supply Hyattized cars

*These car builders furnish
"Hyattized mine"
equipped with Hyatts—*

American Car & Foundry Co.
Anniston Electric Steel Corpn.
Brown-Fayro Co.
Chrisman Foundry Co.
Duncan Foundry & Machine Co.
Eagle Iron Works Co.
Enterprise Wheel and Car Corpn.
Egyptian Iron Works
Fulton Pit Car Co.
J. R. Fleming & Son Co., Inc.
Galena Iron Works
Gustafson Mfg. Co.
Helmick Foundry & Machine Co.
Hercules Mfg. Co.
Hockensmith Wheel & Mine Car Co.
J. R. Hoe & Sons, Inc.
Irwin Foundry & Mine Car Co.
Kanawha Mfg. Co.
Koppel Industrial Car & Equip't Co.
Lincoln Steel & Forge Co.
Lorain Steel Co.
Phillips Mine & Mill Supply Co.
Pittsburgh Boiler & Machine Co.
Salt Lake Iron & Steel Co.
Southern Wheel Co.
Star Mfg. Co.
Suppes Forge & Foundry Co.
United Iron Works
The Watt Car & Wheel Co.
Young Car Co.

Good mine cars and good bearings are inseparable.

The thirty manufacturers who supply Hyatt equipment produce the bulk of American cars. Your orders in their hands are well placed—evidence the satisfactory operation of so many thousands of their cars.

Welded to the integrity of these builders is the continued pledge of Hyatt to furnish bearings that cut the cost of mine car haulage.

Thirty-six years specializing on one product—backed by the financial resources of General Motors Corporation—you are amply assured that your specification for Hyatts on cars from these builders will meet your every haulage requirement.

HYATT ROLLER BEARING COMPANY

Newark

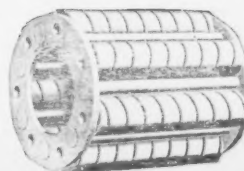
Huntington

Pittsburgh

Chicago

HYATT

ROLLER BEARINGS

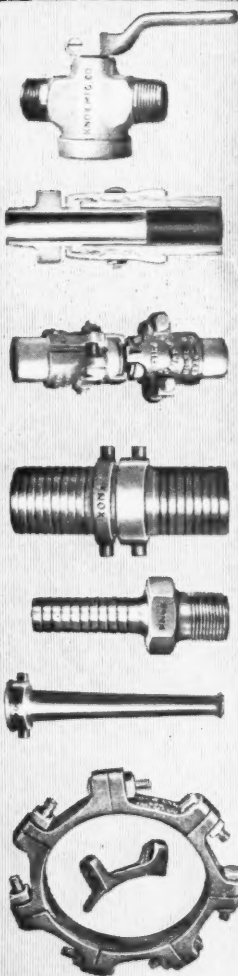


KNOX

Valves-Couplings-Nipples-Clamps-Menders

MINING SPECIALTIES

The World's Standard



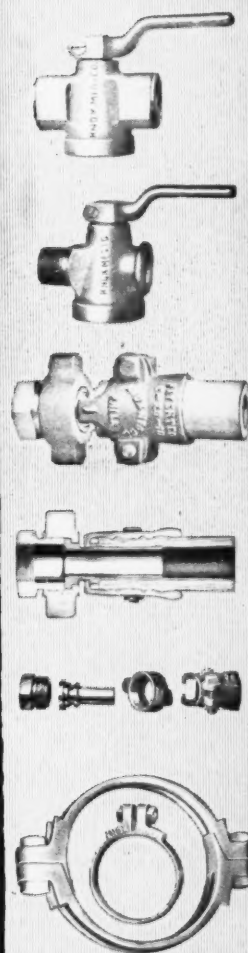
ARE YOU
ENJOYING

that comfortable feeling of which you are assured by accepting "KNOX" as a part of your own organization?

When your requirements for Rock Drill Couplings, or Throttle Valves, or Special Hose Connections present themselves, pass them along to your Valve and Coupling Department—KNOX.

Our entire personnel concentrates its efforts for the greatest satisfaction and least expense to KNOX customers.

We must serve—as if we actually were your Valve and Coupling Department.



KNOX MANUFACTURING CO.

INCORPORATED 1911

817 Cherry St.

Philadelphia, Pa.

BETTER MAKE MISTAKES THAN KILL INITIATIVE



No man, nor any organization of men, is right all the time. The only way to avoid all mistakes is to avoid all initiative. Some manufacturers take the attitude that it is their business only to sell goods, and that it is the customers' business to know how to use them. This is a comfortable attitude, and it undoubtedly reduces the manufacturer's chances to make mistakes.

We would rather take the chance of making a mistake in a sincere effort to save money for a customer by recommending a change in the kind of explosive he is using or in his method of blasting, than to follow the easy course of selling him what he has always used, when, in our judgment, this is not the best explosive for his work.

Our salesmen are drilled in this point of view. Admittedly, they are not right all the time; but remember that they are instructed not merely to get the order, but to get the order for the explosives that will break the most material for you, in the best condition, and at the lowest cost. If they insist upon trying to help you, it will be to your interest to consider their recommendations carefully.

For after all, our men are familiar with many blasting operations. They do not know the details of your own work as you do, but they are often able to save money for the man who will interpret their wide experience in terms of his own intimate knowledge of his job.

To mention only a few of the Hercules contributions to better blasting: Hercules Special No. 3 often reduces costs underground in the same proportion that Hercules Special No. 1 reduces costs in the open; Herco blasting saves from 20% to 40% in well-drill shooting when it is applicable; Hercules Extra Gelatins are effecting marked savings by replacing the regular gelatins on many jobs. If not one of these, then perhaps some other suggestion by a Hercules salesman may be valuable to you.

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WILKES-BARRE, PA.

THE MINING CONGRESS JOURNAL

DECEMBER, 1926

CONTENTS

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EDITORIALS

The Purpose of Conventions.....	833
The Public Right in Coal.....	833
Applied Standards.....	834
The Right Kind of Facts.....	834
The Machine Age.....	835
Politics and Natural Resources.....	835
Fixed Limits.....	836
A Fully Developed Need.....	836
Mine Wages and Prices.....	837
Congress Assemblies.....	838
The Stock Transfer Tax.....	838
Cotton and Copper, Coal and Clay.....	838

FEATURE ARTICLES

Program, Twenty-ninth Annual Convention.....	839
Government Contacts With Mining.....	841
Is the Tariff an Issue—By Herbert Wilson Smith.....	846
Labor Relations in Metal Mining—By Cleveland E. Dodge.....	849
Coal Mine Mechanization.....	851
Federal Control—The Bugaboo of the Coal Industry— By George H. Cushing.....	852
Legislative Review.....	854
Topographic Mapping and Its Relation to Revival of Western Mining—By C. H. Birdseye.....	857
Mining Industry as 1926 Closes and 1927 Appears on the Horizon—By Dr. Henry Mace Payne.....	860
Mining Congress Work in Taxation Reviewed—By Mc- Kinley W. Kriegh.....	862
Present Activities in the Oil Shale Industry—By Victor C. Alderson.....	864
Mining Operations at Chuquicamata, Chile, S. A.—By William H. Goodrich.....	871
The Progress of Leaching and Electrolytic Metallurgy— By M. F. Coolbaugh.....	879
Storage Battery Power for Coal Mine Operation—By Graham Bright.....	881
Mechanical Loading in Coal Mines—By S. W. Farnham.....	883
Steel and Its Use in Coal Mines—By George Atwell Richardson.....	886
Permissible Mining Equipment.....	890
Mexican Mining Laws—By F. H. Newell.....	891

DEPARTMENTS

PRACTICAL OPERATING MEN'S DEPARTMENT, METALS.....	871
PRACTICAL OPERATING MEN'S DEPARTMENT, COAL.....	881
NEWS OF THE MINING FIELD.....	894
THE NATION'S VIEWPOINT.....	912
WITH THE MANUFACTURERS.....	918

NEWS

Coal Mine Mechanization.....	851
The Awakening of the South.....	870
Permissible Mining Equipment.....	890
Bureau of Mines Activities.....	892
International Bituminous Conference.....	893

PRACTICAL OPERATING MEN'S DEPARTMENT

METALS

*Mining Operations at Chuquicamata,
Chile, S. A.*

*The Progress of Leaching and Electrolytic
Metallurgy*

COAL

*Storage Battery Power for Coal Mine
Operation*

Mechanical Loading in Coal Mines

Steel and Its Use in Coal Mining

Published Every Month by the American Mining Congress, Washington, D. C.

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**Shovelers load from
2 to 3 times as much
coal with a Jeffrey
Pit Car Loader as by
shoveling directly
to mine cars**



Turn to the next
page for a com-
plete description
of the Jeffrey Pit
Car Loader

JEFFREY
COAL MINE EQUIPMENT

**Jeffrey-Standard
Coal Mine
Equipment**

Coal Cutters
Combination Cutter
and Loader
Drills
Conveyor-Loader
Sectional Conveyor
Pit Car Loaders
Locomotives
Mine Fans
Tipple Equipment
Crushers

A Low Cost Loading Machine in Practically Any Ro

The Jeffrey Pit Car Loader is well fitted for use where local conditions, such as delays due to taking down top rock, dirt bands in the coal, picking the coal at the face, etc., make it impractical to install a more complete system of loading machines and conveyors.

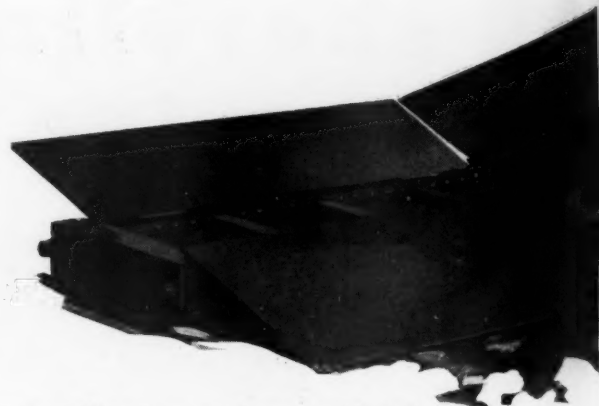
With the Jeffrey Pit Car Loader there is no lifting, carrying, and tossing of coal over the side of the mine car with a shovel. By reducing the physical effort required to load the coal it is possible for a man to double or triple his loading capacity.

The men merely shovel the coal onto the foot end of the conveyor. The loader elevates and conveys it to the mine car. In wide rooms a motor-driven portable conveyor or a scoop is used to load onto the loader.

Rooms can be loaded out more quickly. This means fewer working places to maintain production and a saving in machinery, track, timbering, ventilation costs, etc. Long moves for cutting machines and loaders are eliminated.

The Pit Car Loader is pivotally mounted on a self-propelling truck and arranged to swing in a complete circle if necessary. These features permit moving from one room to another easily and quickly.

Two power-driven capstans, one on each side of the machine, are provided



for handling the coal cars while they are being loaded. Built in various heights to suit coal cars.

The Jeffrey Pit Car Loader can be used to advantage even in low coal.

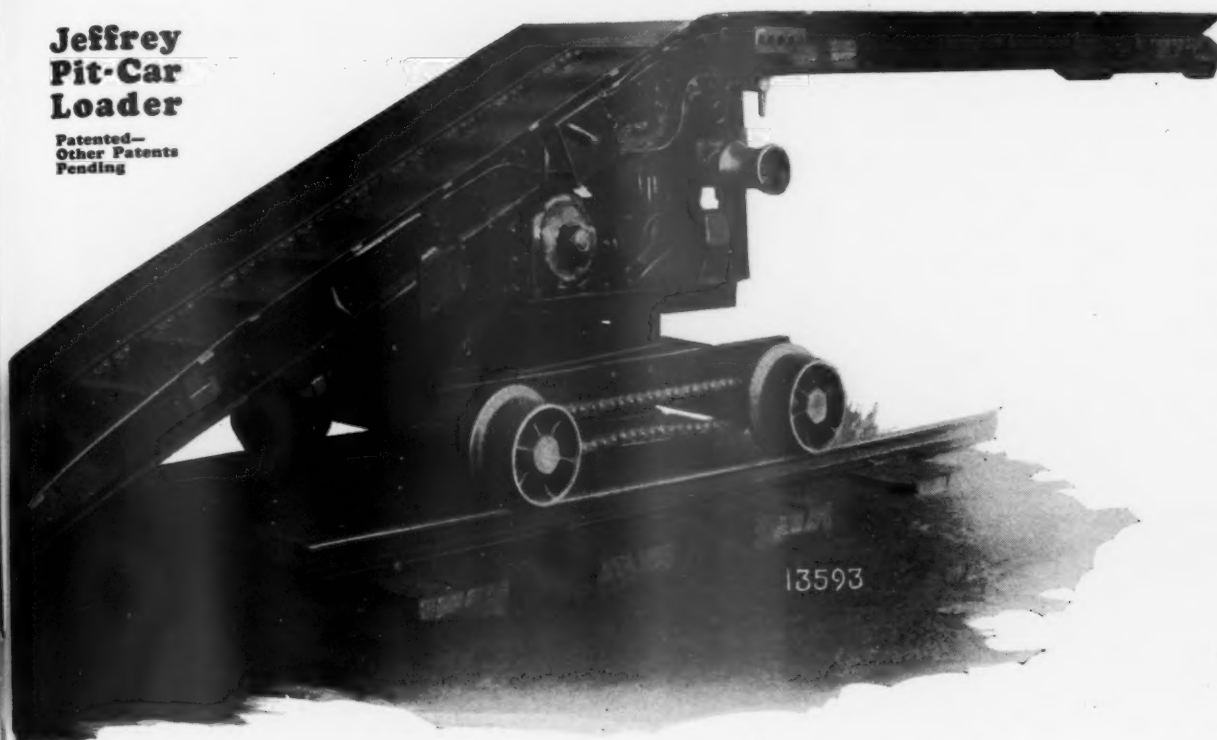
If you will fill in the coupon on the opposite page, Jeffrey Mining Engineers will be glad to tell how the Jeffrey Pit Car Loader will fit into your system of mining. The low cost of this machine will surprise you.

JEFFREY

ine That Will Prove Profitable y Room or Entry Work

Jeffrey Pit-Car Loader

Patented—
Other Patents
Pending



THE JEFFREY MANUFACTURING COMPANY
958-99 North Fourth Street, Columbus, Ohio

Gentlemen:

How can the Jeffrey Pit Car Loader reduce our loading costs with a comparatively low initial cost? Our loading conditions are as follows:

- | | |
|---|-------------------------------|
| 1—Height of coal..... | 2—Height of coal car..... |
| 3—Capacity of coal car..... | 4—Width of working place..... |
| 5—Average number of tons per shift loaded by miner at the present time..... | |
| 6—Does the miner pick out any considerable quantity of dirt before loading..... | |

Name..... Title.....

Firm Name.....

Address.....

Coal Mine EQUIPMENT

Other Jeffrey Equipments for Concentrated Mining



The Conveyor-Loader—for loading coal in long face mining. A 100-ft. face can be loaded out twice in 8 hours. The crew will do their own cutting, shooting, timbering, etc. Cutting and loading costs are reduced 1/3 or more.



Sectional Conveyor—Carries coal from Shortwaloader to a fixed loading point where it discharges into mine cars. Made in 6 ft. sections to follow steady advance of mining machine. In long face mining coal is received from Conveyor-Loader and carried to cars on entry.



Portable Conveyors—for service between Shortwaloader and Sectional Conveyor when drawing rib or working in wide rooms, also used as face conveyor for hand loading. Built in two types: Belt Construction for hand loading and Chain Construction for machine or hand loading.



The Shortwaloader—For use in room or entry. Cuts, loads, and conveys. Stays right on the job until room or entry is worked out. Operates continuously, except during shooting. In the above illustration the machine is shown ready to load across face.

Catalog No. 425-A completely describes Jeffrey Equipments for Concentrated Mining

The Jeffrey Manufacturing Company
958-99 North Fourth St., Columbus, Ohio

New York
Philadelphia

Pittsburgh
Scranton, Pa.

Charleston, W. Va.
Chicago

Denver
Salt Lake City

Birmingham
Montreal, Canada

Sales and Service Stations

Pittsburgh.....600 Second Avenue
Salt Lake City.....153 W. Second South Street

Terre Haute, Ind.....319 Cherry Street
Birmingham.....26 South 20th Street

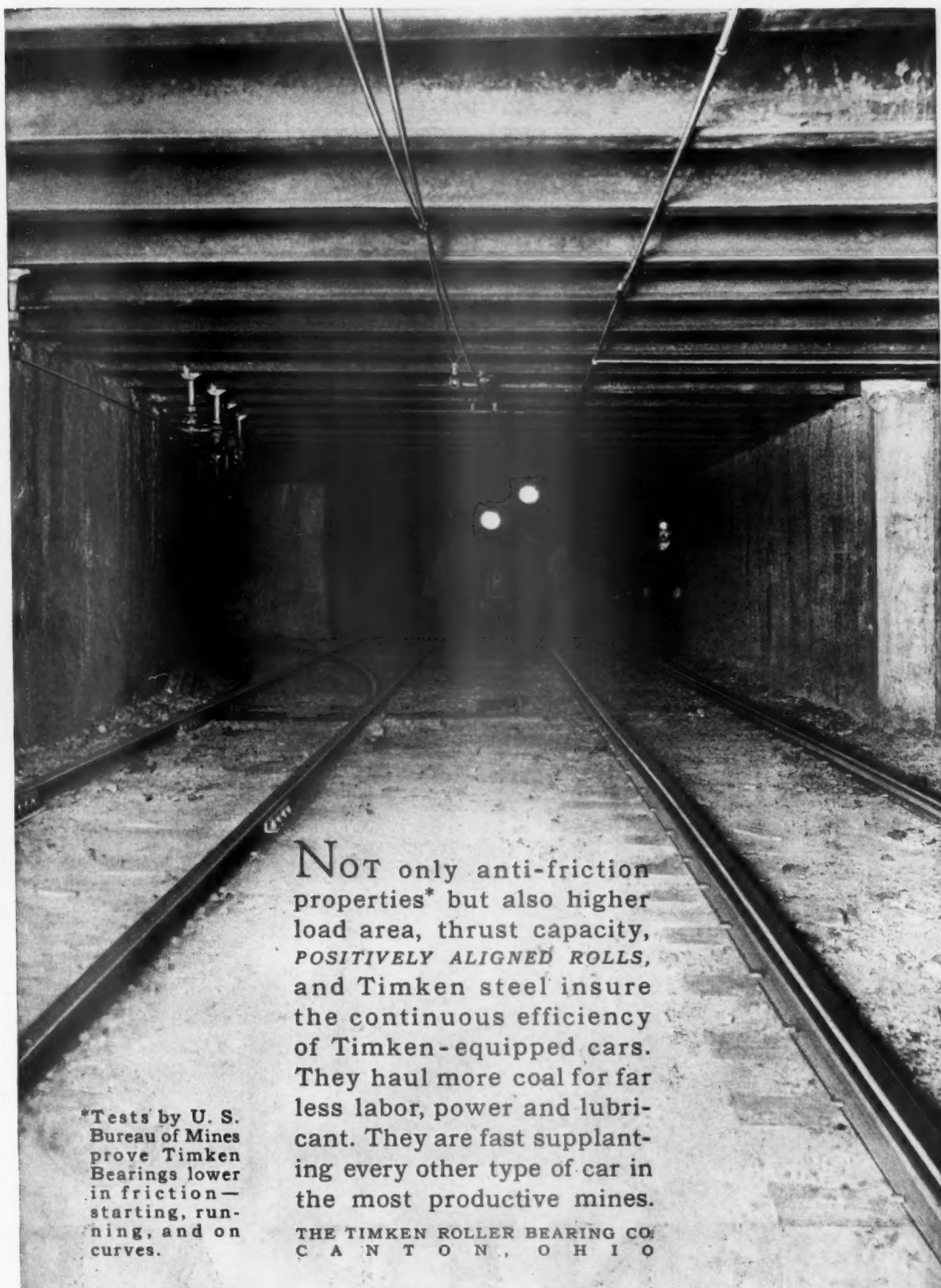
A new Jeffrey Service Station is ready to serve you at 122 N. Main St., Winchester, Ky.

JEFFREY

COAL MINE EQUIPMENT

Jeffrey-Standard Coal Mine Equipment

Coal Cutters
Combination Cutter
and Loader
Drills
Conveyor-Loader
Sectional Conveyor
Pit Car Loaders
Locomotives
Mine Fans
Tippie Equipment
Crushers



NOT only anti-friction properties* but also higher load area, thrust capacity, *POSITIVELY ALIGNED ROLLS*, and Timken steel insure the continuous efficiency of Timken-equipped cars. They haul more coal for far less labor, power and lubricant. They are fast supplanting every other type of car in the most productive mines.

*Tests by U. S. Bureau of Mines prove Timken Bearings lower in friction—starting, running, and on curves.

THE TIMKEN ROLLER BEARING CO.
CANTON, OHIO

TIMKEN *Tapered Roller* **BEARINGS**



Power-

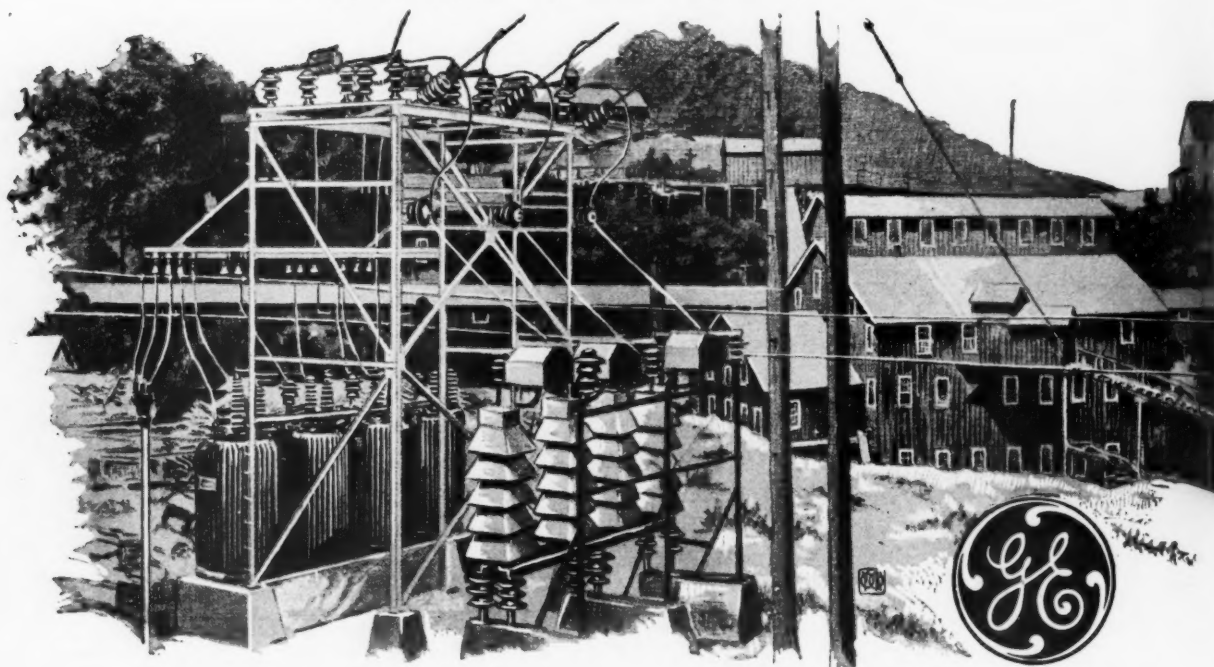
Lower Costs at Load Centers

Today's mining practices require the use of electric power in continually increasing amounts. The modern substation, with its highly efficient and dependable service, reduces to the minimum the cost of supplying this power.

Wherever operations are scattered, or where the location of electrical equipment divides it into distinct groups, best results and assured economies are obtained by high transmission voltage and low distribution potentials.

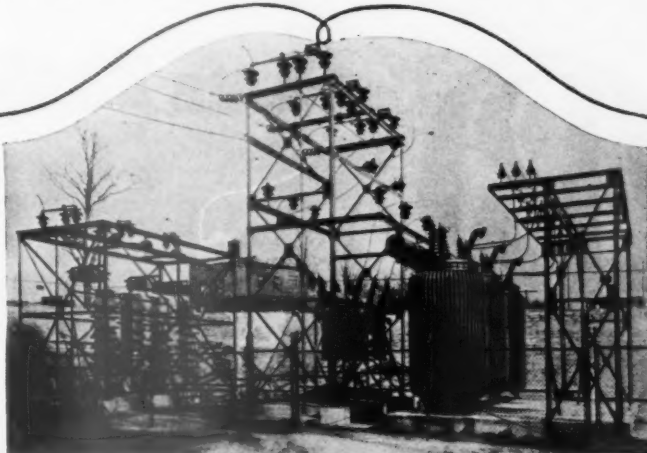
Where G-E transformers are used, their high efficiency invariably results in utmost dependability and lowest power costs. These transformers are built with materials which have been tested and tried in the best-fitted laboratory of its kind. The quality of steel, wire, and insulation used in G-E transformers is the result of careful test and research to maintain the leadership accredited to G-E transformers everywhere.

There is a standard G-E transformer for practically every voltage and frequency required by mines, mills, smelters and refineries. Complete G-E Outdoor Stations are available in any capacity for any service anywhere.



GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

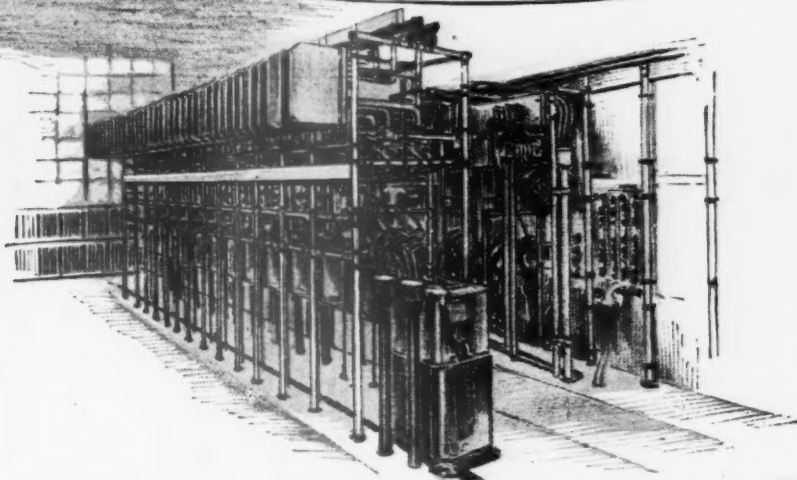


Main incoming line—G-E Step-down Transformer Substation, 57000/2300 volts. Part of the complete electrification, with G-E apparatus, of a modern mining operation.

EVERY item of a substation, from incoming line wire to the outgoing distribution system—Transformers, Switches, Lightning Arresters, Fuses, Steel Towers—to the last bolt it can be furnished by G-E. Thorough electrification of metal mine operations, and G-E equipment combine to obtain high unit production and low unit costs in

Tramming—Hoisting—Stripping—Mechanical Loading—Ventilation—Air Compressing—Pumping—Milling—Smelting and Refining—Conveying—Power Generation—Power Distribution and Conversion—Etc.

Whatever the need, G-E meets it so dependably and economically that each General Electric installation recommends another.



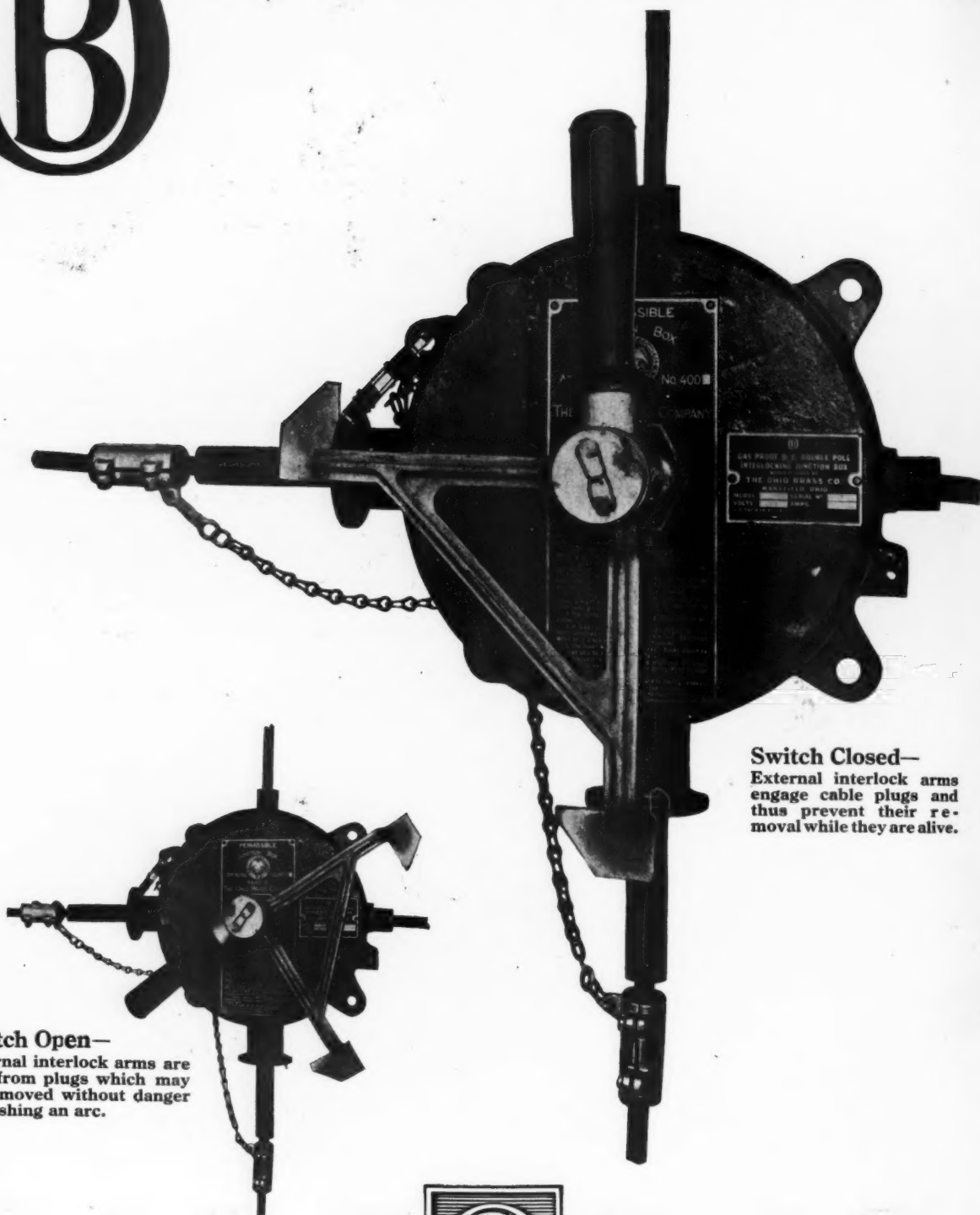
ELECTRIC

SALES OFFICES IN PRINCIPAL CITIES

401-3



Announces a



Junction Box

New—

Approved—

Gas Proof—

**The only permissable
device of this nature on
the market today**

PROVIDES fuse protection for loading machines—cutting machines—conveyors—hoists—lighting circuits—all of your important coal producing elements. It prevents damage to motors of these machines, whose continuous operation is vital to maximum efficiency and greatest profits.

But of greatest importance is its explosion proof construction. Making or breaking the circuit, or blowing of the fuse, takes place inside the gas-proof, malleable iron case. There is no possibility, therefore, of drawing a spark which might ignite any gas present and precipitate a mine explosion.

The new O-B junction box bears the approval plate of the U. S. Bureau of Mines.

It meets a requirement that has never been met before.

It is the first acceptable device of its nature available for gaseous mines. It fills a long-felt need.

It is gas-proof. It is fool-proof.

It is double pole and will break the circuit under load if emergency requires or if done by accident. It has a quick-break feature and the arc is divided into four parts.

The full story of its application and design details is told in a pamphlet, No. 54M—just issued. You will be interested in this information. Write for it now before it slips your mind.

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited
Niagara Falls, Canada
261M



Fill in and mail the coupon for complete illustrated data on this new approved Junction Box.

Ohio Brass Company
Mansfield, Ohio

Please send me the complete details on your new Gas-Proof Junction Box.

Company	Individual
Position	Street Address
City	State

261M

Ohio Brass Co.



PORCELAIN
INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING
MATERIALS
VALVES

Write for Illustrated
Catalog
A-500

Roebbling

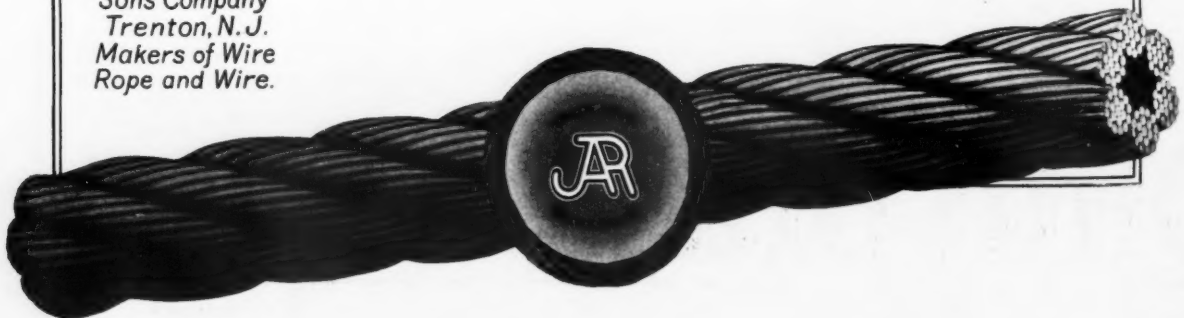
Blue Center Steel Wire Rope

Roebbling Blue Center Steel Wire Rope is the ultimate choice of discriminating buyers for every purpose for which wire rope is used.

In mining, exceptional conditions exist which must be met by the use of wire rope possessing exceptional qualities. Roebbling Rope, by its long, continuous service, has proven that it possesses these qualities.



John A. Roebbling's
Sons Company
Trenton, N. J.
Makers of Wire
Rope and Wire.



10 "Reasons Why"

The New Goodman Slabbing Machine

LOW-MAINTENANCE FEATURES

Cutter arm is reversible, so wear on cutting side may be compensated by turning cutter arm over.
Cutterhead ring has three positions, which gives it a triple service life.

CUTTING ELEMENT MAY BE INVERTED

As a Top Cutter (here shown) the cutting range is from 31 1/2 inches to 84 inches above the rails.
As a Center Cutter (inverted) the cutting range is from 16 inches to 72 inches above the rails.

TWO ROOM WIDTHS

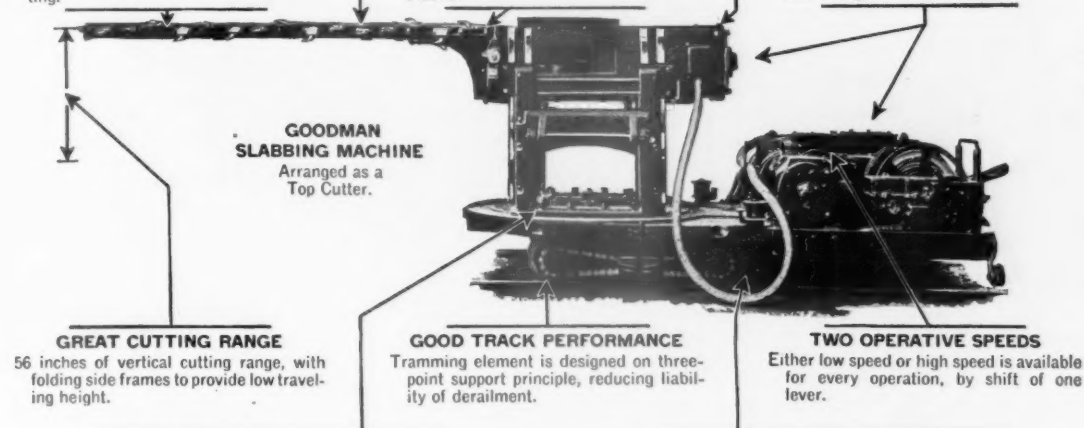
23 feet with standard 7-foot depth of cutting.
25 feet with special 8-foot depth of cutting.

DURABLE CUTTER CHAIN

Alloy steel blocks and straps, heat treated, have the hardness and toughness necessary for the most severe cutting conditions.

ELECTRICAL PARTS

Motors and all electrical equipment may be of either Open type, Enclosed type, or Government Approved type, as conditions require.



GREAT CUTTING RANGE

56 inches of vertical cutting range, with folding side frames to provide low traveling height.

GOOD TRACK PERFORMANCE

Tramming element is designed on three-point support principle, reducing liability of derailment.

TWO OPERATIVE SPEEDS

Either low speed or high speed is available for every operation, by shift of one lever.

TURNTABLE LOCKED AT ALL TIMES

Rotating assembly is mechanically driven through worm gearing, which is self-locking.

SHOE TYPE BRAKES

Powerful braking effect is transmitted through a system of levers to brake shoes.

A Proved Coal Cutter

Powerful—Simple—Rugged

See your copies of "Electrical Mining" for July and October, in which machines of this type are shown as doing

Unusually Difficult Work

and making

Unusual Performance Records

If your copies of the magazine have been misplaced let us know and we will send you others.

GOODMAN MANUFACTURING COMPANY
PITTSBURGH 4746 to 4854 South Halsted Street CINCINNATI
CHARLESTON, W.VA. CHICAGO, ILL. HUNTINGTON, W.VA.
ST. LOUIS DENVER BIRMINGHAM

STOP AUGER SHARPENING Costs



Showing "Fishtail" Style Bit, Socket, and Old Auger With End Dressed For Socket

←
Cutter can be furnished in same twist and width cutting edge as your blacksmithed bits.

←
Socket costs only a few cents and lasts forever.

←
Five minutes blacksmith work fixes any old auger for socket. If desired we can furnish short sections for specimens.



Showing "Half Diamond" Style Bit in Socket Riveted to Old Auger

THE DIAMOND Detachable Auger Bit can be furnished in the same size and style as blacksmithed bit used at any mine.

It outlasts 8 to 15 blacksmith sharpenings because it is made of Heat-Treated Alloy Steel—costs less than the common hand-made bit because it is made by machinery in quantity production.

You furnish your miners blacksmithed bits at a loss. You can furnish them the Detachable Bit at a profit and at the same time eliminate all moving and blacksmithing of augers at the mine.

Free samples on request. Send us specimen of blacksmithed bit used or state (1) diameter of holes bored, (2) diameter of old augers at twist, (3) width of each cutting edge of bit, (4) whether for Electric, Hand or Breast Drill.

If your miners bore their own holes, write us for bulletin and names of 400 mines where Diamond Bits have turned auger sharpening overhead into a profit for the company and provided their miners with a better tool.

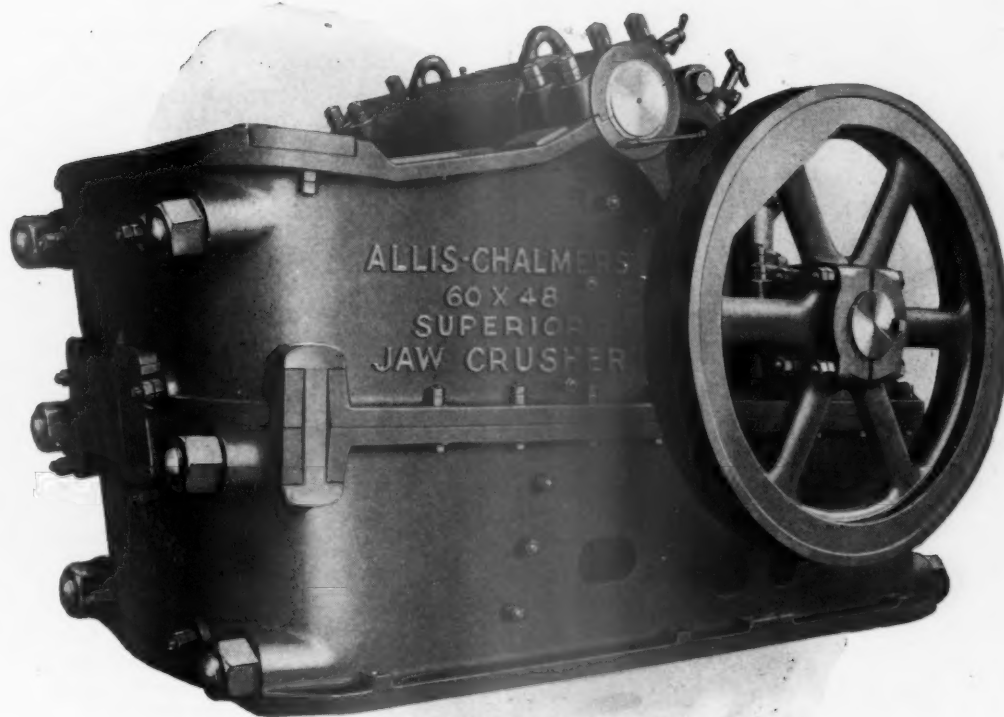
PRICES

Cutting Bit (give style of cutter and size of hole) . . . 50c each
Socket (give diameter of old auger at twist) 60c each
Quantity discounts on application

JOS. McLAUGHLIN COMPANY

JOLIET, ILL.

JAW CRUSHERS



SIZES 15" x 10" TO 60" x 48"

RUGGED CONSTRUCTION

LARGE CAPACITY

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

Joplin Is Crowded With Americans



American Continuous Filter in the Jaybird Mill of the Commerce Mining & Royalty Company, Miami, Oklahoma. Note the breaking up of the relatively dry cake. The Tri-State District produces more than one-third of the world's zinc.

THAT Joplin district is a big producer. Workings and mills dot the landscape for miles around, accounting for a very respectable tonnage.

Just how much of this tonnage comes from American Filters hasn't been figured up. But as some seventy-five mills are equipped with these Filters, they must be a strong factor in production.

That American Filters are highly regarded by mill men is a matter of record. Many advantages—both installation and operating—appeal to these men who must continually aim for more efficient and more economical milling.

American Filters contribute their share toward low cost milling.

Bulletin 106
points out in detail
these advantages:

- Smallest floor space
- Low head room
- Cloth-changes
by sectors
- No mechanical
agitators
- Different products
simultaneously

Sizes range from 4 ft.-1 disc
to 8½ ft.-10 disc units.

UNITED FILTERS CORPORATION

Main Office and Laboratory: Hazleton, Pennsylvania

New York

Chicago

Salt Lake City

Los Angeles

Export Office: 25 Broadway, New York

Code Address: Unifilter, New York



The 208-pound Drifter

The Standard of Comparison In the Rock Drilling Field

A Machine for Each Drilling Job

Because of the great difference in rock formations and working conditions, one size of drill will not meet all demands. Realizing the advantages of drills varying in size and power, Ingersoll-Rand Company has developed three sizes, which will answer the requirements of drifter drilling in all parts of the world.

The 208-lb. machine—The X-71 is the largest drifter drill made by Ingersoll-Rand Company. Its powerful rotation and exceptional hole-cleaning ability make it a favorite wherever deep holes in hard or soft rock are encountered.

The 164-lb. machine—The R-72 is the logical drifter for most drilling problems in mine or tunnels. It is a fast driller, stays on the job, has exceptionally low upkeep and maintenance cost, and is easy to handle.

The 125-lb. machine—The N-72 combines unusual efficiency and durability with light weight. In close quarters, or where light weight is essential, this machine has no equal.

I-R drills are built with the skill and experience of 55 years of rock drill manufacturing. They are designed by expert engineers, are made from the best material obtainable, are built in modern shops with modern machinery and serviced after they are on the job. This is the customer's guarantee of 100% efficiency from his rock drills.

In addition to the drifters, Ingersoll-Rand Company makes many sizes and types of "Jackhammers," "Stopehammers," Plug Drills, Submarine Drills, and Channelers. The line is complete. Let us assist you with your problems.

INGERSOLL-RAND COMPANY—11 BROADWAY, NEW YORK CITY

Offices in principal cities the world over

Canadian Ingersoll-Rand Co., Limited
260 St. James Street, Montreal Quebec



The 164-pound Drifter



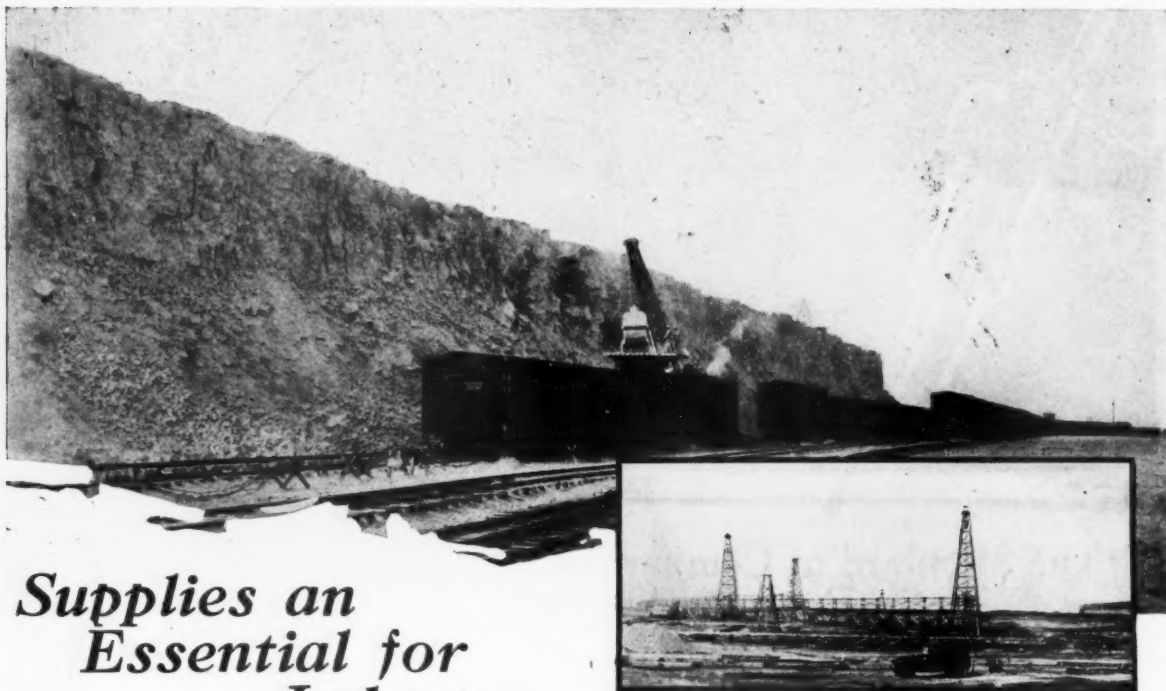
The 125-pound Drifter



Ingersoll-Rand

156-1.1

SULPHUR MINING



*Supplies an
Essential for
Industry*

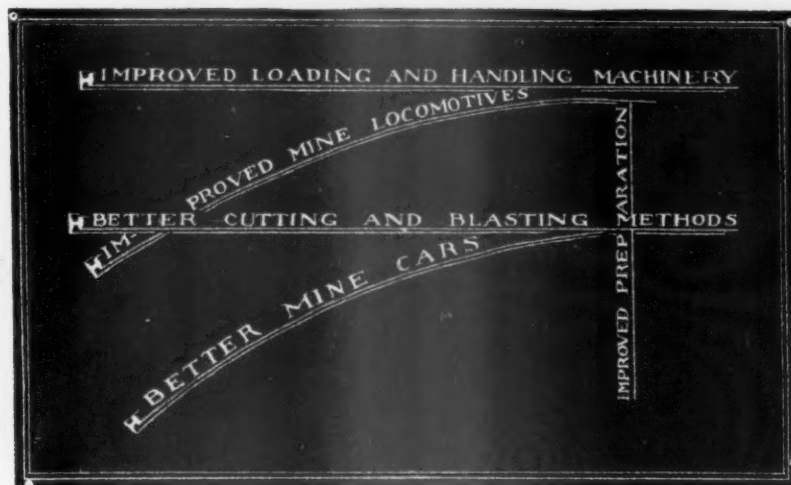
Sulphur is essential in pulp making, rubber vulcanizing, and explosives manufacture. Its greatest use—accounting for over 70 percent of the total consumption—is for making Sulphuric Acid.

Fertilizer manufacture, steel pickling, oil refining, and a variety of products and processes now require about 7,000,000 tons of Sulphuric Acid yearly.

Our mines at Gulf, Texas, yield sulphur running 99½ percent pure. Output ranges from 2,000 to 5,000 tons daily. Stocks above ground, ready for shipment, are maintained at over 1,000,000 tons.

T **TEXAS GULF SULPHUR** **C.**
41 E. 42nd Street New York City
Mine: Gulf, Matagorda County, Texas

WHEN PLANNING IMPROVEMENTS IN YOUR MINING SYSTEM REMEMBER—



no equipment can be better than your track

The efficiency of all mining equipment comes back to track. Many experts rate it as the most important of all mine machinery. The success of loading machines is predicated upon track systems that are properly designed to feed cars to and from them rapidly; that will stand up under the requirements of faster production; that will allow the same locomotives to haul heavier trains; that will carry modern cars with their smaller wheels without danger of derailments.

Tracks scientifically constructed and maintained cost much less than poor track, save power and increase production. Let CENTRAL engineers bring you the result of their experience when you plan improvements for your mine.

Let us send you our Catalogue No. 3 of mine track equipment.

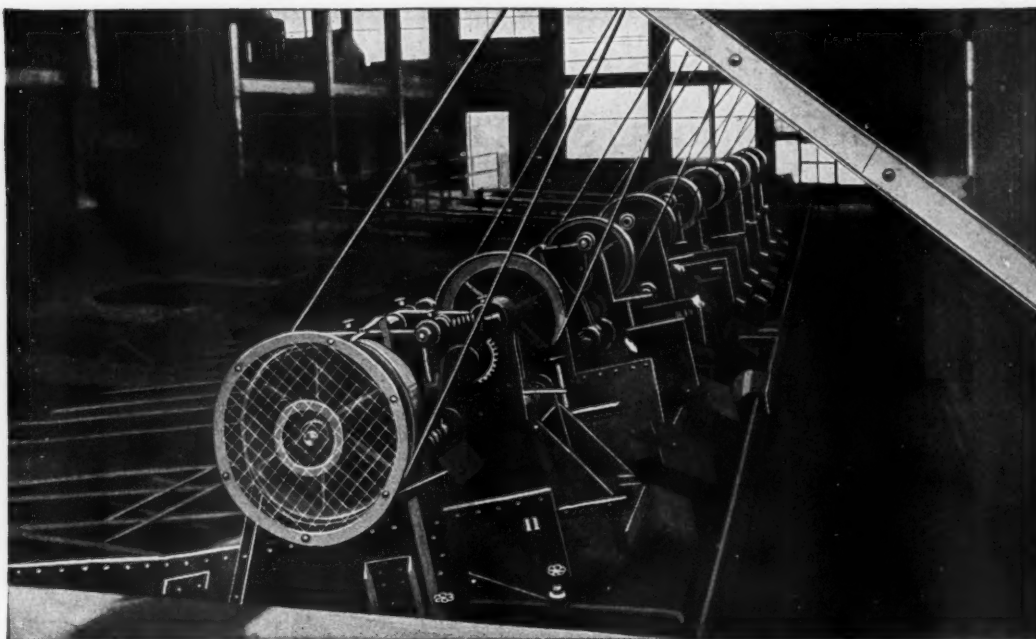
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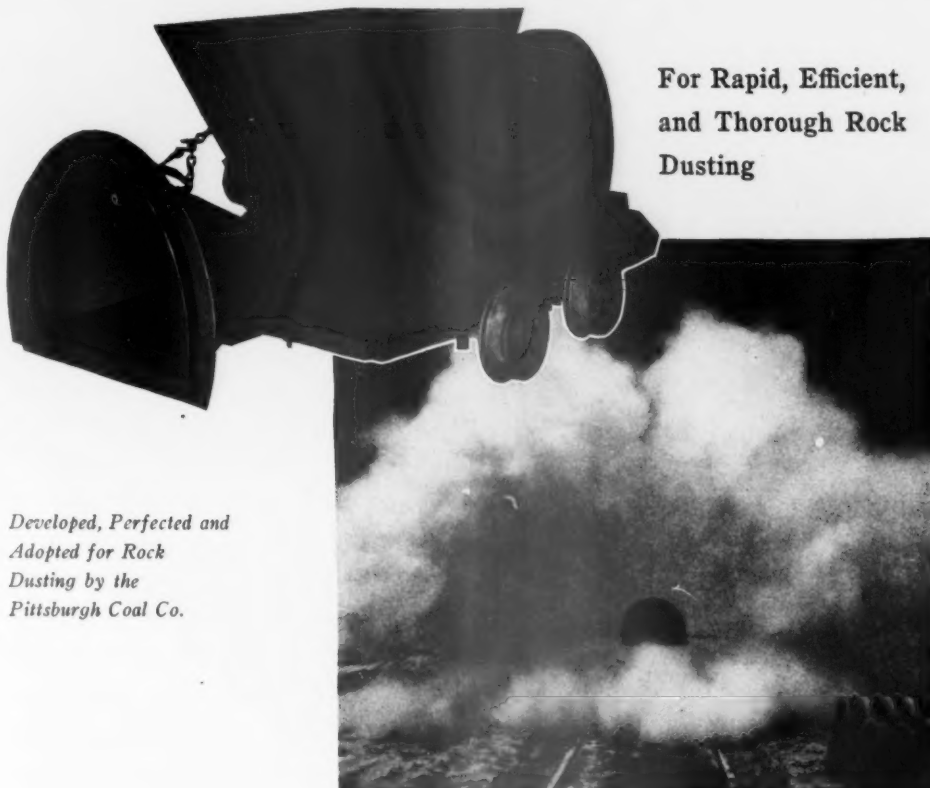
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*Developed, Perfected and
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The Legrabon Mine Dusting Machine distributes 125 pounds of rock dust per minute. This capacity permits a rate of travel of 40 to 45 feet per minute and keeps the machine and its operator in advance of the dust cloud. Discharging around the entire perimeter of its semi-circular nozzle it makes a perfect dust barrage—no part of the mine surfaces can be slighted. The high velocity of discharge drives the dust into every hole and crevice and uniformly coats every inch of exposed surface.

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This 3-Point Suspension of the entire chassis is an exclusive feature of the Vulcan Trolley Locomotive. One pair of springs supports the frame through one set of hangers. One end of another pair of springs is held by other hangers. The opposite ends of the springs engage an equalizing bar extending across the machine and supported in the center. By means of this arrangement shocks are absorbed, the weight is evenly distributed and the locomotive runs smoothly over any ordinary inequalities of track.

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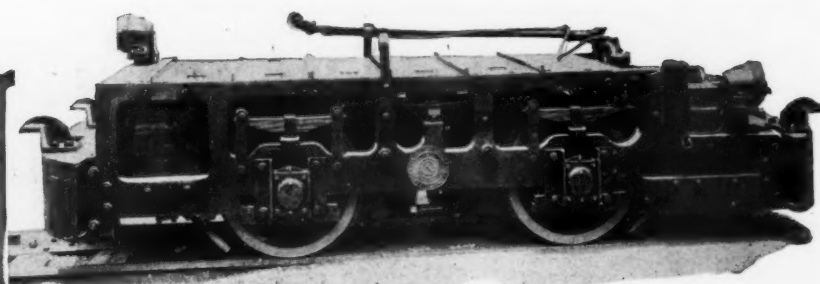
Each side frame is cast in one piece and of steel bar design, thus combining maximum rigidity as well as accessibility. The open spaces permit ample ventilation and simplify inspection.

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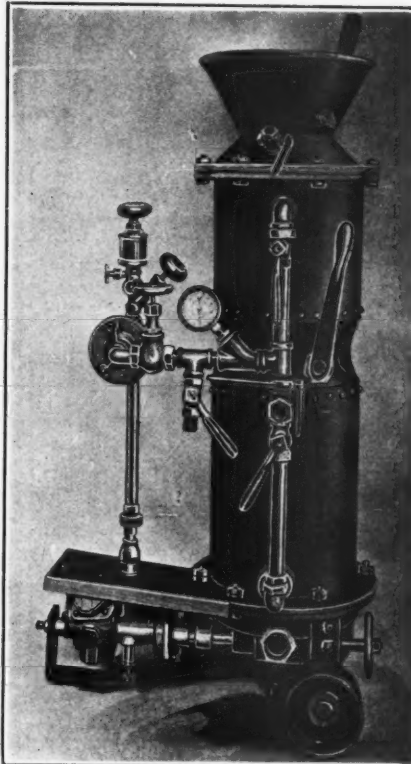
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The Bituminous Mining Laws stipulate:

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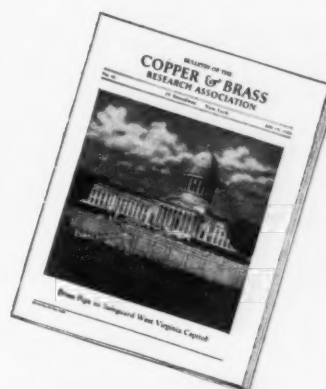
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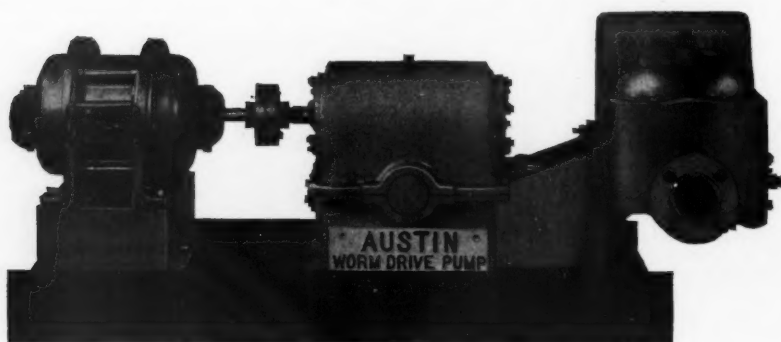
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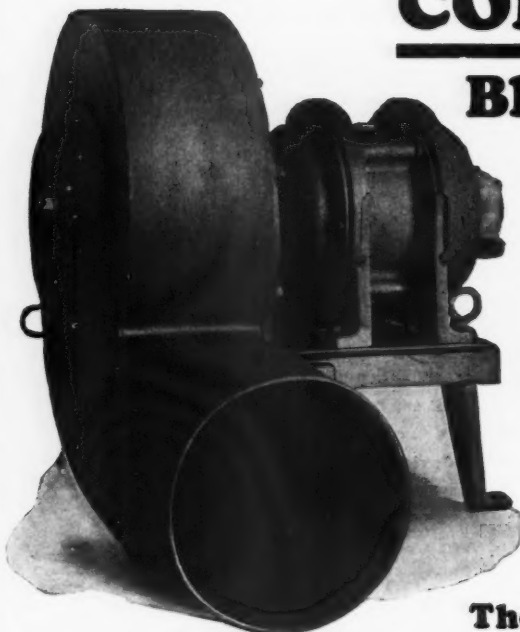
You can only appreciate what an improvement the Austin worm gear pump is by trying one out in your mines.

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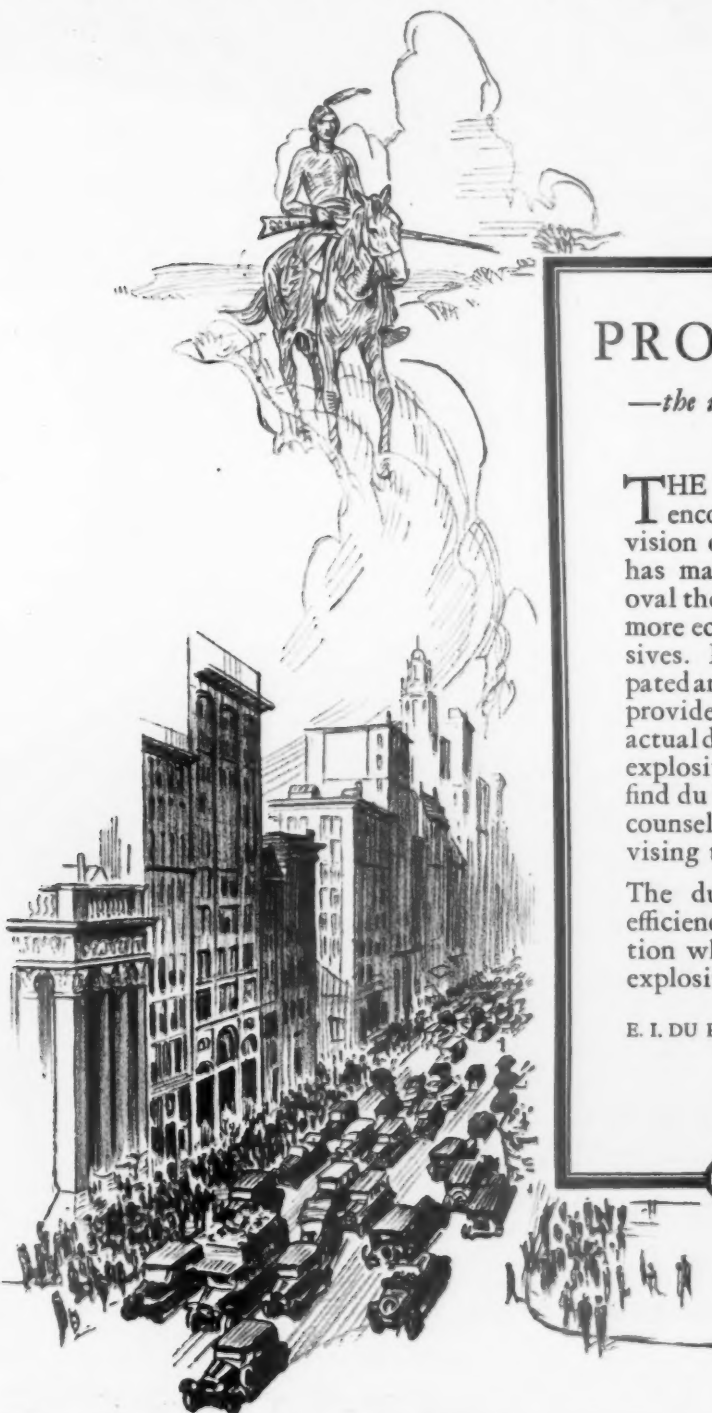
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The permissible explosive
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Long experience and confining our business exclusively to the design and manufacture of ventilating appliances insure your receiving the ultimate in efficient construction, service and operating economy. Every Robinson Fan is built to do its job better than any other you might buy. It is designed to save its cost many times over during its long and trouble-free life. It is guaranteed to fit your particular needs.

That is why Robinson Engineers are proud of every Robinson installation—why they "follow through" and advise you of needed changes in your ventilation system as conditions in your mine necessitate. All this at not a cent of extra cost to you.

TURBINE FANS, CONIFLO DISC FANS, VENTILATING SETS OR TUBING BLOWERS, FORCED DRAFT FANS, WALL FANS AND PRESSURE BLOWERS FOR EVERY MINE VENTILATION NEED.

Above is illustrated Robinson Tubing Blower, widely used as a utility fan. Wheel diameters 8" to 28". Wheels of cast aluminum alloy or electrically welded steel plate. Casing and motor base of steel plate, electrically welded. Eight angles of discharge.

FOR 30 YEARS ENGINEERS IN AIR MOVING EQUIPMENT



World's First Oil Refinery ~ Built in 1855 Still in Service

The Encyclopedia Britannica, Eleventh Edition, in its article on *Petroleum*, reads as follows:

"Crude petroleum was experimentally distilled in the United States in 1833, by Professor Silliman [d 1864] and the refining of petroleum in that country may be said to date from about the year 1855, when Samuel M. Kier fitted up a small refinery with a 5-bbl. still for the treatment of the oil obtained from his father's salt wells. At this period the supply of raw material was insufficient to admit of any important development in the industry, and before the drilling of artesian wells for petroleum was initiated by Drake, the 'coal oil' or 'shale oil' industry had assumed considerable proportions in the United States."

"* * * In the earlier refineries, the stills, the capacity of which varied from 25 to 80 bbls., usually consisted of a vertical cylinder constructed of cast iron or wrought iron, with a boilerplate bottom and a

Such is Durability of Wrought Iron

A MODEST wrought iron tank, standing four feet, eight inches high, with a few simple pipe connections—the world's first oil refinery!

This is the historic 5-bbl. still referred to in the Encyclopedia Britannica as being used by Samuel M. Kier seventy-one years ago, for refining the strange fluid which spoiled his father's salt wells.

This venerable relic may still be seen doing duty as a separator at a gas well near Salina, Pa. Considering the severe corrosive conditions to which it has been exposed, one wonders that there is still a crumb of it left intact. But there it is, much battered by Father Time, yet doing its bit every day as of old.

As any old-timer will tell you, only wrought iron could last that long.

That's why Byers Pipe, now as in the early days of this old relic, is made from the same honest, old-

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Slowly and laboriously it is produced, this metal, in order that there may be built into it the rust-defying quality which so surely protects costly installations against the havoc of pipe failures.

With every passing year, the dependability of Byers Pipe in heating, plumbing, water supply, drainage and power systems becomes more clearly demonstrated. Against the slightly higher first cost of a Byers installation is the definite assurance of double life in service.

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the
**Spiral
Stripe**
protects you against
mistakes and substitution
Also look for name and
TM&P rolled in metal

BYERS PIPE

GENUINE WROUGHT IRON

EICKHOFF MT-15

Electric Jigging-Conveyor Drive

Squat and sturdy, precise in operation, the Eickhoff MT-15 is a notable member of the largest individual group of jigging-conveyor drives on the market.

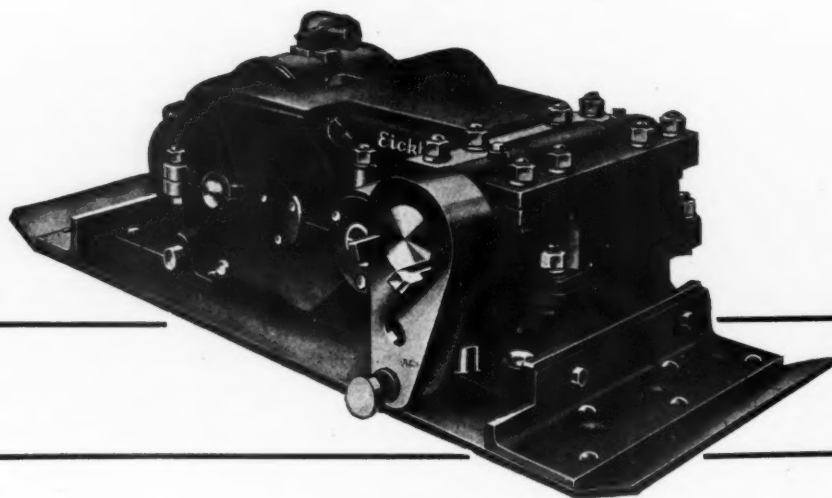
The MT-15, being a recent addition to the Eickhoff line, is an example of the most advanced design in the manufacture of such machinery.

Standing only 18 inches in height, and weighing about 2,000 pounds, the MT-15 is the most readily portable jigging-conveyor drive of like capacity now available.

The MT-15 is fully enclosed in a dust tight case and, like the MT-5 and MS, is splash lubricated. The motor is positioned on its side, feet bolted vertically to the drive frame—forming one combined unit and permitting greater ease in moving.

The release of the MT-15 marks an important accomplishment by an organization that has produced the 20,000 installations of Eickhoff Conveyor that are now in use.

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DECEMBER, 1926

NUMBER 12

THE PURPOSE OF CONVENTIONS

THE American Mining Congress seems to have developed a very definite policy concerning its conventions. It has divided its activities into four sections—coal, metal, non-metallic, and economic problems surrounding all of them. Formerly they attempted to combine under one general convention all convention activities, with sessions devoted to all phases of mining problems. This plan was very successful in the earlier days when the organization was small, but as it grew, as it represented more and more of the mining industry, it became increasingly difficult to find sufficient time to discuss at one convention all of those things the different branches of the industry wished discussed. It was therefore determined to hold four conventions annually. One for coal, one for metals, one for non-metallics, and one at which all branches might meet together to discuss their economic problems. Therefore, and thereafter, the meeting of practical coal operating men has been held each year in the central coal fields, and is attended by thousands of coal operators, discussing entirely practical operating problems. The Western Division holds its annual meetings at some central western point, and this meeting is attended by large groups of metal mine operators, who discuss operating problems, and state problems, and pass resolutions for presentation to the annual conventions of the parent body. Since the formation of the Southern Division, its annual conventions have been held at some central point, and the discussions have centered about non-metallics, in which the South abounds. The annual conventions of the main organization have for the past two years been held at Washington, D. C., and have confined their discussions exclusively to political, legislative and economic problems.

The program for the Twenty-ninth Annual Convention, to be held at the Hotel Mayflower, Washington, December 7-10, inclusive, will discuss such interesting phases of mine economics, and such important problems as "Stabilization of Mineral Production," "Politics and Natural Resources," "Taxation," and "Labor Relations in the Mining Industry."

The tentative program, as published elsewhere in this Journal, is one to command the interest not only of the mining fraternity, but of the public as well. Discussion of these subjects will form a platform of performance for the mining industry during 1927. And it will be a platform upon which will stand coal and metals, oil and non-metallics, ferrous and non-ferrous metals.

These annual conventions of The American Mining Congress have drawn a fine line of demarcation between the ghost of selfishness and the spirit of cooperation. They have demonstrated that a united industry on problems of economic importance can bring about the best good for each and for all.

And this is the purpose of conventions.

THE PUBLIC RIGHT IN COAL

THE so-called right of the public in coal is the same as its right in wheat and corn, in tea, coffee and spices, and in all the necessities and luxuries of life which are usually available for a price. The purchaser by contract and for a consideration measured by money secures possession of the things which he needs. If the merchants in his community fail to meet his requirements at reasonable prices, he finds fault but he has no right to demand. His so-called right is not a right but a privilege, a privilege which is his because of a civilization based upon two fundamental rights—the personal rights of liberty and property; rights which go hand in hand; rights without which none of this life's requirements would be available for purchase and without which civilization would fail.

There is general respect for the rights of personal liberty. There is general respect for the ownership for all property except coal. In spite of public clamor the ownership of coal is entitled to the same respect as is conceded to the ownership of other property. Coal is not charged with a public use and therefore is not subject to governmental regulation.

The man who first fenced a piece of land and presumed to say, "This land belongs to me," was the founder of society. From this society proceeded the state which by law defends the rights of the individual members of society. Civilization can not exist, and governments would be of no use, except for the purpose of protecting the individual against the encroachments of his neighbors.

The ownership of coal lands is not different from the ownership of other property. The right of Government to coerce the individual either to produce coal or to stop producing coal has as little foundation as the right to require a man to work without his consent. One is the right of personal liberty, the other the right of personal property, each of which must be held sacred if civilization is to survive.

There is but one inducement which can be justified to secure either the performance of service or the transfer of property, and that is the inducement of price. It applies with equal force to the production of all other commodities as to coal.

We may concede that wheat is a public necessity but the owner of wheat lands is under no obligation to raise wheat. He may raise wheat, oats, or potatoes, or he may leave his land fallow. The only obligation that rests upon all property is that it shall pay its share of the support of Government.

The only advantage in the ownership of coal lands must come through the sale of coal at a profit. Without selling the coal the land is worthless and in a few short years would be absorbed by the tax collector. Price then is the only inducement and will always be a sufficient inducement for the production of coal, and the theory that the Government has any right to exercise a control which it does not exercise over other industries is without basis of fact.

APPLIED STANDARDS

IT IS indeed gratifying to those who have toiled so patiently and consistently to bring out a set of recommendations that will simplify mining methods, practice and equipment, to have some of the largest producing companies adopt and put into actual operations these recommendations. At least four of the larger bituminous and as many of the anthracite coal companies, who are spending enormous sums in re-equipping their properties are specifying American Mining Congress standards in their purchases. In the metal mining industry a large producer who is spending several millions of dollars over a five-year period of reconstruction, is using these standards. Other metal mining companies are cooperating with the movement not only by carrying on experimental work and helping develop the standards, but by adopting them rapidly.

Three years ago the coal mining branch of the Standardization Division of the American Mining Congress brought out the Handbook of Standard and Approved Coal Mining Methods, Practice and Equipment. The coal mining industry has utilized approximately 1,500 of these handbooks, and the demand continues. This is a very good indication that the coal mining industry is "doing" as well as "talking."

The matter of passage of these standards (all of which are tentative and subject to change as new developments take place) through the American Engineering Standards Committee, has been a long tedious process. It has taken them, in some instances, four years to appoint a reviewing committee. To date they have endorsed as a national standard, under the sponsorship of the American Mining Congress and the United States Bureau of Mines, the recommendations concerning underground power transmission and power equipment, which is known as "Safety Rules for Installing Electric Equipment Underground."

There are now before the A. E. S. C. ten recommended standards, some of which are in preliminary stages and others, such as Coal Mine Drainage, Wire Rope, Mine Tracks and Signals, and Ladders and Stairs, that have passed the censor body, and are now ready for approval as tentative American standards.

While this worth-while but slow-moving vehicle has been getting under way, the mining industry has literally adopted the recommendations, and when they finally do approve these standards, they will long have been in operation in the mining industry.

The term "Standardization" is no longer misunderstood. It has required considerable patience, education and explanation to get across to the industry the real meaning of this term. The Department of Commerce through its Division of Simplified Practice has done yeoman service in this connection; the Petroleum Institute, which has a very live and very real Department of Oil Industry Standards, has contributed much to this understanding, and the American Mining Congress, pioneer in this work, so far as the mining industry is concerned, has never ceased its efforts to bring about the proper understanding. In spite of the work already accomplished the movement is but in its infancy. Each day brings a keener realization on the part of those most concerned—those who manufacture and those who purchase and utilize mine equipment—that it means a tremendous saving; that it means greater efficiency in operation, and simplification of what at best must be a widely varying and complicated system. But there are certain fundamentals concerning methods and performance under these varying conditions that may and have been clarified through applied standards.

THE RIGHT KIND OF FACTS

HOLDING firmly, as we do, to an old-fashioned notion about the proper function of government, we shall reserve the right to believe that it is no proper activity of government to teach one part of the people how to get the best, in a trade, of another part of the people. We have an abiding fondness for that old-fashioned belief that since the Government gathers all the money it ever possesses from all of the people, it should spend that money only in the interest of all of the people or it should not be spent at all. On that old fashioned belief, we have grave doubts whether the Government is in the proper business when it singles out any one industry and attempts to promote its welfare by the use of money gathered from every citizen—paupers only excluded—in the land.

Still if over our scruples and our protest the Government shall insist upon spending public money to gather facts which will help the coal industry to help itself to the money of coal consumers, we feel that there is one kind of information which should not be neglected.

To begin with we feel that there has developed, in recent years, a veritable fad for kinds of information which are perfectly worthless from any possible standpoint. We will not venture into an analysis of the various "facts" upon which so much emphasis has been put in recent years but will confine attention to one. Perhaps the most insistent demand has been for information as to the cost of producing a ton of coal.

Let it be assumed that we know the cost of such production, even to the mill. Let us assume further that that figure is known to every man, woman and child in the whole United States. But, what of it? The knowledge of what it has cost to produce the coal will not enable one operator to collect on that amount of coal, if the people can buy their coal from another for less than that price. And the same knowledge will not reduce the price to the consumer one penny if the market shall dictate that the coal be sold at a profit of \$1 the ton. What, then, is the value of the information? To what possible useful purpose can it be put?

Let us concede, then, that much of the information insisted upon has been worse than worthless. That forces attention upon the kind of information that might prove valuable. Let us say that, by a round-about process it can be proved that it is of value to the whole people to have the coal business run on pretty nearly an orderly production schedule. It is unthinkable that the Government could be a party to a scheme which would rearrange—or attempt to rearrange our whole system of habits. Therefore, the Government can not provide for a regular production schedule by the day and ask the people to change their habits and accept the coal when it is produced, rather than as now, when they want to use it. If we are not going into that great adventure and if we still want an orderly program for the industry, there is but one thing to do. The Government should set out to discover, by inquiry, what are the buying habits of the American people with respect to coal. Having discovered those habits, it can tell the industry on what sort of a schedule it ought to produce coal in order to keep abreast of the demand.

We shall continue to insist that such activities are not listed among the proper functions of any government. Still if our own government wants to act outside its normal character and if it wants to dabble in other people's business, the project just mentioned is one which might appeal to the common sense of those who have to pay the bill.

THE MACHINE AGE

RECENTLY a usually well-informed, if somewhat biased, gentleman suggested that the present trend of industry toward the use of machines showed a decadent nation. And he urged the adoption of either the shorter day or the shorter week as a relief from the strain of the Machine Age.

There are those who fail to realize that real progress comes only through change. The changes during the past twenty-five years are startling. They have brought to us, as a people, added years, greater education, time for greater enjoyment of those things designed to amuse and edify us. They have built up great industries to serve the need of leisure hours. Industries which more than supply the need for employment of those workers displaced through the use of machines. Civilization has been advancing in an amazing manner.

In the mining industry the adoption of mechanical appliances has been slow. Metals have been more progressive than coal in many things mechanical. In coal, operators have had to combat the old idea that ditches should be dug with teaspoons because in so doing more labor was required. It is a fallacy that only education can overcome.

The American Mining Congress started its campaign for complete mechanization of the mines in 1919, when it created its Standardization Division for the purpose of discussing ways and means for simplifying and reducing operating costs through adoption of Simplified Mining Methods and Equipment. Out of that division grew the discussions of practical operating problems which have been a feature at its conventions during recent years, and which have finally developed to the point where whole conventions are held for the purpose of discussing ways and means of eliminating operating problems through adoption of mechanical equipment.

One of the things brought out repeatedly at these meetings is the fact that the industry is spending millions of dollars in experimental work, the result of which is not available to the industry as a whole. It has been proved that certain types of equipment perform extremely well under certain conditions; conditions, perhaps, which obtain in a large number of districts. But it is rarely that one district makes available to another district the result of its investigative work.

The American Mining Congress has been selected by both the operator and the manufacturer as the agency best adapted to correlating the facts concerning mechanization of the mines. That organization has accepted the responsibility, and at its annual convention at Washington, D. C., December 7-10, will present a plan for its accomplishment to its Board of Directors for final indorsement.

When this indorsement is received, the American Mining Congress will immediately put into effect the plan, which will be carried out under the auspices of the National Standardization Division. The work will probably begin with an investigation of mechanical loading problems in the coal industry. The engineer or engineers who will conduct the investigation will be men of the highest standing in the industry. The reports as submitted must first carry the indorsements of the committee of operators and manufacturers sponsoring the work, second the indorsement of the Standards Division, and as a final check will bear the official indorsement of the Board of Directors. The basic plan is outlined in this issue. It is subject to addition or modification by the Board of Directors, but the fundamental principle will not be changed.

It is to be hoped that the mining industry will give every cooperation and facility to the committee in the development of this great plan of education and information.

POLITICS AND NATURAL RESOURCES

POLITICS: *The Administration of Public Affairs.*

NATURAL RESOURCES: *Forests, Lands, Mines, Water Power, and Any Natural Advantage.*

ONE politician plus one natural advantage equals one legislator. One legislator plus political aspiration equals one demagogue. One demagogue imbued with the spirit of reform results in an epidemic of threatened legislation.

Thus we evolve epidemics of coal regulation, the chills and fever of railroad consolidation, and the malnutrition of public land ownership in the West.

To intelligently administer the development and utilization of our natural resources for the common good is one of the most exacting problems of citizenship. Our industrial prosperity has evolved from a mass of political hatreds, and it has only been in recent years that we have come to recognize the importance of our raw materials in great crises.

Our mineral resources, both metallic and non-metallic, have been the battle ground of the politician, who has used them in his struggles for self-perpetuation, and as a consequence we have had a succession of laws affecting exploration, exploitation and exportation, title, taxes and tariff.

Raw materials play so important a part in our industrial economy that political units should not be vested with economic functions. The broad questions of conservation and economic utilization are not to be solved by political expediency or demagogic declarations.

The possession of a major portion of the world's most desirable resources, with a highly mechanized industry, and a standard of living far superior to that of any other nation, has produced an anomalous situation. So rapidly have we advanced that in many states the American workman's children of today study their lessons by electric light, and are carried to a central school in an automobile bus, fed warm lunches by a zealous parent-teachers' association, while the father of the family is protected by group insurance, and the mother receives the cooperation of maternal welfare organizations.

Our resources are being consumed at rapidly increasing rates, and as new areas are opened up, by-product utilization developed, and more complete extraction obtained, we hear demands on the one hand for rigid conservation, while on the other we are assured that science will always find a substitute. Between the Scylla of ultra-conservatism and the Charybdis of profligacy, we may define true conservation as intelligent utilization, utilization not only of materials, but of men, time and money.

The solution of these outstanding problems will be reached by conference and study, not by legislation. The brain power which has produced our great industries is capable of steering those industries. The King Canute of Legislation may command the tide of national industry to alter its course, but that tide, operating under economic law, may neither be stayed nor diverted, although the harbors which it serves may be choked to traffic by useless regulation and unwise political manipulation.

FIXED LIMITS

WHATEVER else may have come out of the conference on bituminous coal at Pittsburgh in November, it was demonstrated with remarkable clarity that, at best, progress in scientific directions is slow and piecemeal. And, it also became obvious that that is a good, rather than a bad thing. A violent change in products as a result of a sweeping scientific discovery, would very easily prove destructive because there would not have developed quite as quickly a market for those new products. Therefore, we come out of the conference with the comforting assurance that scientific developments are not likely to be so rapid or so revolutionary as to outrun the evolutionary changes in business itself, and, therefore, in the market for the new things that can be produced.

The whole conference was most interesting because it took on the nature of a period of inventory taking as to the progress that has been made along scientific lines in what might be called the destructive distillation of coal. For instance, it has been known for several generations that coal is an interesting compound of chemical elements and that out of a pound of coal could be made a great variety of products, available for use over a tremendous range. It is so well known as to be trite that out of a lump of coal will come a producer of heat and a first-class refrigerant; a violent poison and its antidote; the very essence of sugar and its opposite; the whole range of colors; and the elements which will destroy wood, as well as other elements which will preserve it. If, therefore, coal should be broken up into its component parts, it could be utilized in practically all of the applied arts and sciences. But, it was not known to what extent these things could be produced in quantity nor yet what degree of purity of products might be expected. The conference was designed to disclose these unknown facts. There is in the possibilities of coal both something of value and something commercially dangerous. That is, it might be possible to develop something of great value out of coal, but, at the same time, the recovery of this one valuable thing might develop as by-products so many other articles which could not be sold, that the whole operation would result in a financial loss merely because a market had not been developed for the other things which, intrinsically, were of equal and greater value. Therefore, it is of no practical use to recover all the possible elements in coal until there is a commercial market for all of them. It is, therefore, comforting to have such an eminent assemblage as that which gathered at Pittsburgh prove, by their discussions, that scientific attainments in the distillation of coal are so slow that the commercial market has an opportunity to readjust itself before the products can be made available in quantity.

In this direction, one of the most interesting things that came out of the conference was the disclosure that, heretofore, too many burdens have apparently been put on the retort. That is, the original ambition was to obtain from coal the maximum quantity of carbon residue, depressed into a metallurgical coke. That was the primary requirement upon the retort. At the same time it was also desired to obtain the maximum quantity of oil of the right consistency, and the maximum quantity of gas of the proper richness. The retort was expected to yield those products also. However, in the retort, it was necessary to maintain high temperatures in order to get the coke and these very high temperatures proved to be destructive of both the quantity and quality of oil and of the quantity of gas. Therefore,

the present tendency is to move away from reliance upon the single retort to do all of these things. The disposition is to perfect some of the processes in another instrument, leaving to the retort its main function, which is the production of metallurgical coke at high temperatures. The development of these auxiliary devices promises to be slow. Thus before we get the maximum quantities of oil and of gas, the market for these products will have had time to evolve to a point where it properly will take care of the newer products.

A FULLY DEVELOPED NEED

COMPANY unions, stock ownership and employee representation generally was subjected to considerable criticism at the recent meeting of the American Federation of Labor.

We have no brief for any particular plan which shall bring about the most satisfactory relations in the mining industry, but that industry can point with considerable pride to the accomplishments of some of its component parts in establishing happy relations between capital and those it employs. In this issue is an article by Cleveland E. Dodge, vice president, Phelps Dodge Corporation. That company, dealing with a large percentage of Mexican labor and an unusually high type of American labor—two decided extremes—has through Employee Representation established an enviable record, and has demonstrated completely the value of the system which they have installed, modeled on the plan of our Federal Constitution.

Among other mining companies using some form of this type of cooperation is the Bunker Hill and Sullivan, and the American Zinc Co. The latter company has done remarkable work in safety through its internal organization, which is based upon employee representation.

Employee stock ownership is not so widely adopted in the mining industry, but the Bethlehem Steel Corp. offers an effective example of what may be accomplished through this means. A recent announcement of the company states that through this plan the productivity of labor has been increased three times, its wages have steadily increased, and the number of employees has grown from 9,000 in 1904 to 70,000 in 1925.

In the coal industry many strictly union fields are reopening upon a cooperative basis or employee representation plans. It will be well to try out in the coal fields some of the plans that have been so eminently successful in the metal industry, and these successful plans almost invariably center in Employee Representation.

In some of the coal districts a sliding scale of wages has been agreed upon under the newly established cooperative agreements. Many operators finding it impossible to produce coal under the Jacksonville scale closed their mines, and thousands of miners were thrown out of work. With the abnormal demand created by the British coal strike, and the consequent high prices, many of these properties have reopened, with an agreement as to wages based upon a sliding scale, which means larger wages while high prices obtain, and a decrease as coal prices decline. This is analogous to the bonus system in vogue at several eminently successful metal properties.

Mr. Dodge points out that what the mining industry needs is more leaders, more men who are educators as well as operating men and engineers. And with the need so fully developed it hardly seems possible that more of these leaders will not be forthcoming.

MINE WAGES AND PRICES

THE unmistakable drift in recent years has been toward the belief that there is, somewhere and somehow, a discoverable relationship between the prosperity of an industry and the wages which it should pay to its workers. That relationship has never been reduced to any usable mathematical ratio. Labor shows an eagerness to participate in the profits of an industry, but is not equally willing to share its losses. The lack of inclination to go down with business as well as up makes a mathematical ratio of wages to profits an impossibility.

Even on the part of managers there has been more of a groping toward some unknown and elusive ideal than there has been a tendency to study the whole big question in the light of the range of vicissitudes of an industrial enterprise. They have, therefore, stressed profit sharing and have maintained a discreet silence as to loss sharing. While this discussion has been running through about all lines of industrial activity, two distinct groups in the coal industry have tried two opposing ideas. These theories become interesting especially on the eve of a new wage contract, even though it can hardly be said that the results obtained by either are conclusive. As possibly throwing some light upon the larger question, we will recite the opposing theories of these two coal groups.

Some 30 years ago certain of the bituminous operators recognized that, in this country, coal production is about one of the most highly competitive businesses of which mankind has any knowledge. Indeed, when most potato patches are potential coal mines, it is difficult to conceive of anything which is more highly competitive. Recognizing this fact the operators knew that they faced, always, a bitter commercial struggle. Therefore, if they considered their men as partners in the business, they must ask the workers to share in their competitive struggles and, therefore, vary the wages directly proportional to the variation in the selling price of coal. The alternative plan was to exempt the miners from the competitive struggle and hence to fix a wage which was independent of the market price. At that time, the coal business never had been uniformly profitable. The operators said, therefore, that to ask the men to share in the returns of a naturally unprofitable business would not prove attractive to them; in time, such a plan might deprive the industry of its workers. Therefore, a big section of the bituminous industry invited the men to organize themselves into a union. It then entered into a contract with that union which undertook to assure the men a fixed and known wage that would be paid regardless of the price of coal. This was a great adventure in American business—perhaps, everything considered, the most venturesome thing ever attempted by the American industry. It constitutes the only known case where those who engage in a business in which uniformly the margins are either small or nonexistent, have undertaken to assure to their men over long periods a satisfactory wage and a constantly improving standard of living. The amazing fact is that that relationship continued through 30 years and that the operators succeeded in carrying out their undertaking. Today, the scale itself is about to be changed—but not, necessarily, the theory—for the reason that the union has demanded a higher fixed compensation

than any other class of men who are doing comparable work. The union has, in fact, demanded a higher wage than the consumer has been willing to pay.

Throughout the same 30 years another group of bituminous operators, working in an adjoining coal field, adopted and employed an entirely different wage policy. Indeed, for a long time they did not pursue any consistent wage policy, unless it can be said to be a consistent policy to pay, always, a little less than their competitors had contracted to pay. The policy of the non-union operators differed from that of the union operators in this respect. The union operator paid a fixed wage and had a fixed cost of production. He sold his coal when he could and gave his men work when possible. On the contrary, the non-union operators named a price which would keep their mines constantly in operation and then named a wage which, when their men were constantly employed, would give them a higher annual earning than the union miner could make by working part of the time. That policy of the non-union operator was pursued without much change until the appearance of the World War. During and after the war, these non-union operators seem to have added a second section to their policy. They undertook to pay their men the maximum wage that was possible while still running the mines full time. Thus, for five years following the excitable market of 1920, these non-union operators cut their wages to about two-thirds what the union operators were paying on contract. Recently the British strike created a shortage in the world market of about 100 million tons. At that same moment the demand for coal in the United States showed a marked tendency to increase. The world shortage was more than the combined efforts of the United States, France and Germany could satisfy. And, when the United States was exporting its maximum, the demand for coal was a little larger, in places, than the American mines conveniently could satisfy. Therefore, the prices at home rose rather sharply and promised to remain on an extraordinary level for a matter of six or eight months. For that period of a fraction of a year, the non-union mines were assured of steady running time, at good prices. Consistent with their policy of paying the highest wages permitted while still running full time, the non-union operators advanced their wages to a level which, in places, rose above the contract price paid by the union operator.

We thus have two opposing wage theories in two adjoining coal fields. The union mines are attempting to pay a fixed wage, regardless of the market fluctuations. The non-union operators seem to be committed to the policy of paying a minimum wage, as a fixture, and then of paying bonuses for periods when the market, for a period, promises to justify it.

The experiment of the non-union operators is so new it is, of course, impossible to tell how it will work out. For example, the men have recently been given a bonus. It is unknowable whether they will be willing to go back to the old wage when the operators can no longer afford the bonus. However, one result from the recent increase of non-union wages is now known. The union has said that if the non-union operators can afford to pay more than the Jacksonville scale when the market price is good, the union operators can afford to pay the Jacksonville scale all of the time. That is, the union says that any wage can be paid if only the price of coal

is high enough. They see no reason why the operator should not agree to pay them a good wage and then go out and collect the money from the consumers. The union says that the operators have proved recently that they can get a good price for coal. It professes to see no reason why they should not get the same price all of the time. This has raised, in the union field, therefore, a question of control of market prices. The operators say they are unable to control the market and, therefore, are unable to pay the Jacksonville scale. The miners say that if they can control the market they can pay the Jacksonville scale. Thus, there is a vast difference between the operators and the miners in the union field which, undoubtedly, will be reflected in a suspension of relations next April while this question is thrashed out.

CONGRESS ASSEMBLES

ON DECEMBER 6 the National Congress will again assemble, and while it is the so-called short session, it is anticipated that it will be a wordy one, and one into which many legislative measures will be crowded. It will, for some of the members, be their last chance to secure legislation which they have been sponsoring, for when the session closes on March 3 many Congressmen and Senators will retire to private life in accordance with the result of the elections in November. One of the chief items for discussion will be appropriations for the fiscal year. In this the mining industry is interested, as will be seen by reading the article elsewhere in this issue on "Bureaus in Washington Dealing With the Mining Industry." It is appalling to note that the average mine operator in dealing with his Government must consult some 30 departments, bureaus or commissions. All of this number are asking for appropriations (frequently increased appropriations) to carry on work that the industry may or may not be interested in having them do.

This session, being but a continuation of the preceding one, will take up bills introduced in the last session as unfinished business. These call for the discussion of coal regulation, silver investigation, revision of the tariff, various phases of taxation, and it is understood that the Labor Department will undertake to secure a stricter deportation act, and will ask for alien registration and a revision of quotas. The present surplus in the Treasury will certainly be the subject of attack, and it is expected that a large number of bills will be introduced designed to transfer this surplus to what their sponsors undoubtedly believe to be needy pockets.

It is seldom that legislation demanding considerable debate, other than the appropriation bills, is passed at a short session. If this session really wishes to meet the approval of the people, it will enact a minimum of legislation outside of annual appropriation measures. But unquestionably bills now pending, many of them of interest one way or another to the mining industry, will come in for verbal barrage, whether any real action is taken for or against them.

THE STOCK TRANSFER TAX

THE Federal stamp tax on the sale or transfer of shares of stock should be repealed. It is a war-emergency tax. It is a nuisance tax. It falls inequitably upon different stock transactions. It is particularly discriminatory and burdensome to small mine development companies that must issue small shares. It is oppressive to all small companies engaged in any new undertaking or pioneer development. The Federal revenue derived from it is comparatively unimportant from the government's standpoint; but the tax is a serious handicap upon the financing of development companies, and is a nuisance as well as an economic hardship upon stock transactions and corporate financing in general.

Sound and forceful arguments before the Ways and Means Committee of the House and the Finance Committee of the Senate have fallen upon deaf ears. These committees have ignored every proposal for repeal or modification of the tax. While similar taxes on notes, bank drafts, telegrams, and documents have been repealed, the stamp tax on stock transfers has been continued.

Congress apparently will not act until there is an insistent demand for the repeal of the tax from the more than 20,000,000 corporate shareholders affected by it. But even if the tax is not to be repealed, it should be amended to exempt original issues of stock of newly-formed companies, and particularly those organized to engage in development enterprise.

There should be no unnecessary burden upon corporate financing. American business enterprise and prosperity has made great forward strides under corporate organization and management. This is particularly true in the mining industry where small mine development companies are constantly adding new mines and new wealth to the nation's economic and taxable resources.

COTTON AND COPPER, COAL AND CLAY

COTTON must be saved from collapse." So run the headings in the daily papers. But if cotton, why not copper, and coal, and clay—and going on down the alphabet—gold and lead, and silver and zinc.

If Government agencies are to finance one industry, why not all? If agricultural producers may get together and arbitrarily withhold 4,000,000 bales of cotton from the market, and collectively reduce next year's acreage, why should coal producers not combine, and copper operators get together and be able thus to stabilize their own industries in such a way as to operate more efficiently and protect both producer and consumer. Is it because the farmers lack brains and merchandizing ability that a paternal government must supervise their activities? Or is it only the farmer whose prosperity concerns our banking interests?

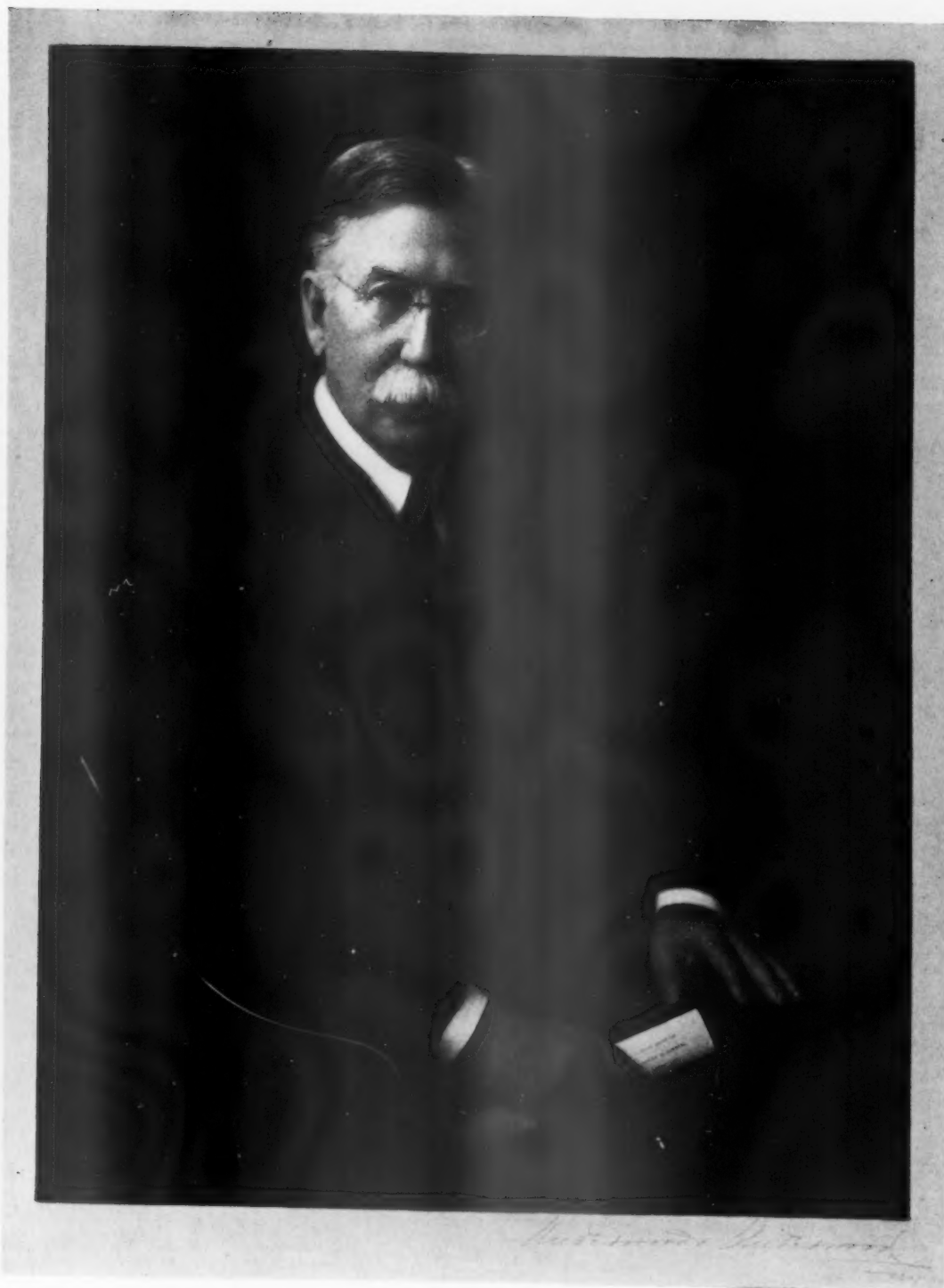
These and other questions along similar lines suggest themselves to the members of the mining industry who have labored long and faithfully to protect themselves against invading legislation, and at the same time to maintain themselves in banking solvency against an ever-rising tide of increased cost of operation.

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AMERICAN MINING CONGRESS

1926



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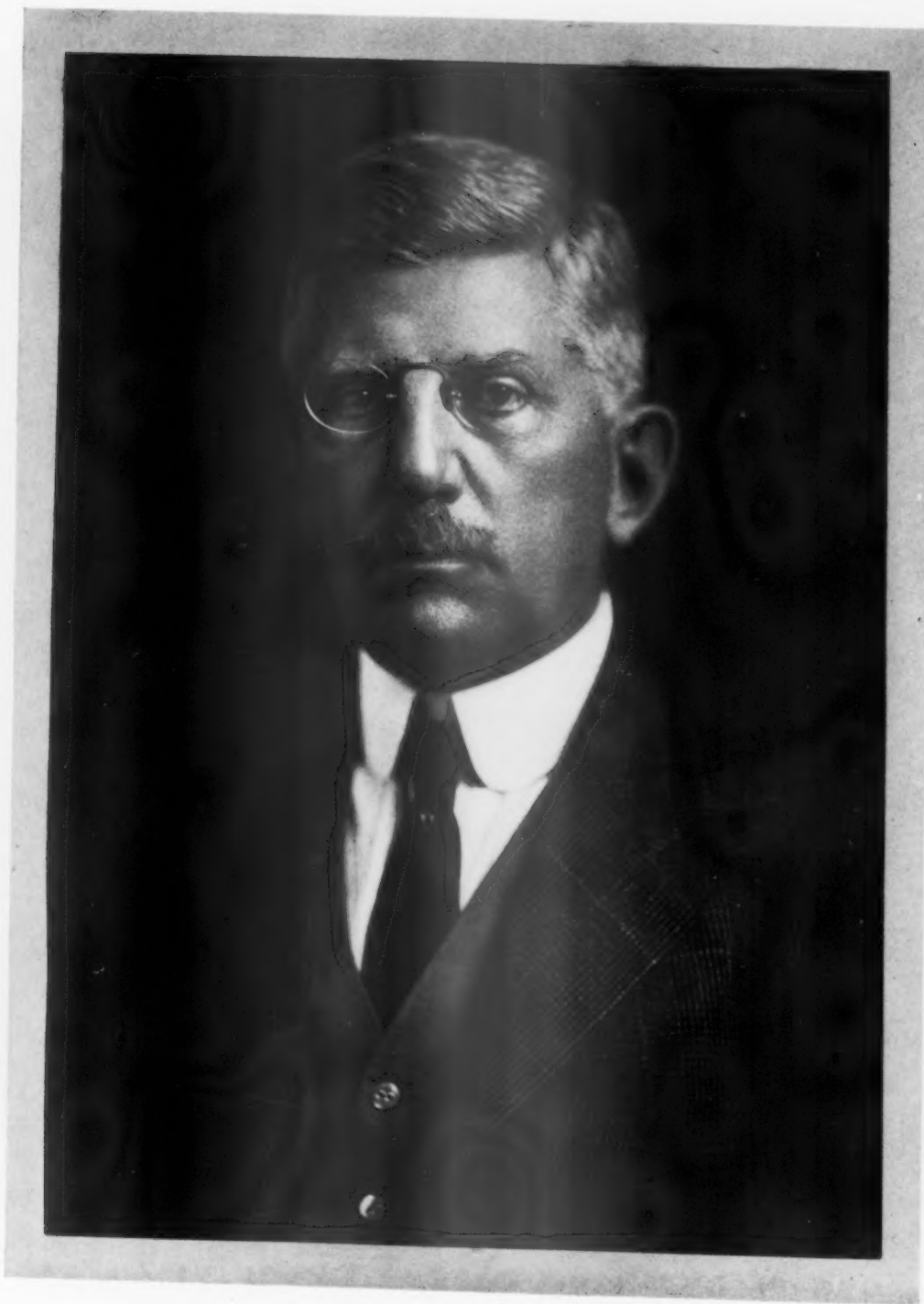
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TWENTY-NINTH ANNUAL CONVENTION

THE AMERICAN MINING CONGRESS

WASHINGTON, D. C., DECEMBER 7 to 10, 1926

The interest of members of every branch of the mining industry will be touched by one or all of the five main topics on which the programs of the sessions of the Twenty-ninth Annual Convention of The American Mining Congress have been built. The Convention is to be held at the Mayflower Hotel, in Washington, December 7 to 10, and the four-day meetings will be filled with a diversity of discussions, important alike to the metal mine operators of the West, and coal operators everywhere.

Problems of economics, public policy, labor and costs of mine operation will be discussed under the five general headings: "Politics and Natural Resources," "A Unified Labor Program," "Stabilizing Mineral Production," "Mine Taxation," and "Elimination of High Costs Through Simplified Methods and Equipment." Leading men of public life, and of the mining industry will participate in the programs, the list of speakers including two cabinet officers.

The relation of politics to natural resources, with particular reference to the problems of the public land states of the West and the proposals for Government supervision of coal operations, to be discussed on the opening day, is of vital interest to every subdivision of the industry. The many angles of the mine-taxation situation also are of interest to all branches of mining, and the stabilizing of mineral production affects every group in some way.

The tax conferences of the Convention on Thursday, December 9, will be preceded by a visit of inspection to one of the

sections of the income tax unit of the Internal Revenue Department.

The progress toward standardization of mine equipment and mine practices will be reviewed in the Friday morning session, and emphasis will be given to the influences that have hastened the trend toward the mechanization of mines. It was the work of the Mining and Loading Equipment Committees of the Standardization Division of The American Mining Congress that brought to its present status the mechanization plan as announced elsewhere in this issue. The Convention program will include announcement and discussion of this plan, and an explanation of the work the engineer is to do in putting the plan into effect.

Opportunities for development in the South will be brought to the attention of the Convention in two of the sessions, with discussions of the development of the non-metallic industries, and of the general mineral development there. The chairmen of the Western Division of The American Mining Congress will make report on activities in the West, and the chairman of the Manufacturers' Division will tell of accomplishments by that group through its annual expositions and the conventions of practical operating men, in cooperation with the main organization.

Altogether the programs for the Twenty-ninth Annual Convention are timely and of such interest that the discussions scheduled should mean a long step toward the solution of the problems to be considered. The program is presented in full on these pages.

Program

NOTE: All Sessions to be held in the Grand Ball Room, Mayflower Hotel, except Third Session, Wednesday Morning, December 8 (which will be held in the Garden.)

Tuesday Morning, December 7

9.00 a. m.—Registration of Delegates.
(Mezzanine Floor, Mayflower Hotel, Connecticut Ave. side.)

10.00 a. m.—First Session of Convention.

TOPIC: "The State of the Industry"

Presiding Officer—Hon. H. W. SEAMAN

ADDRESS: HUGH SHIRKIE, *President, The American Mining Congress*

Fifteen-minute talks by representatives of the mining industry on problems of greatest importance to various branches of the industry as follows:

COAL (Anthracite)—Dr. E. W. PARKER, *Anthracite Bureau of Information*

COAL (Bituminous)—WALTER BARNUM, *President, National Coal Association*

GOLD—J. W. ADY, JR., *Mining Engineer, Colorado Springs, Colo.*

LEAD—FRANK M. SMITH, *Director of Smelter, Bunker Hill & Sullivan Mining & Concentrating Co.*

ZINC—J. D. CONOVER, *Secretary Tri-State Zinc and Lead Ore Producers Association.*

SILVER—FRED CARROLL, *Former Mine Commissioner, Colorado.*

NON-METALLICS—H. T. EDGAR, *Edgar Bros. Co., Metuchen, N. J.*

12.00 Noon—Formation Resolutions Committee.

12.30 p. m.—Informal Get-Together Luncheon for Delegates, Chinese Room, Mayflower Hotel.

Tuesday Afternoon, December 7

2.00 p. m.—Second Session of Convention.

TOPIC: "Politics and Natural Resources."

Presiding Officer—MR. GEO. B. HARRINGTON.
Introduction of Resolutions.

ADDRESSES:

2.00 p. m.—Growing Tendency Toward Centralization of Government in Washington.

Speaker to be announced.

2.30 p. m.—The Coal Argument Against Governmental Interference.

By HARRY L. GANDY, *National Coal Association.*

3.00 p. m.—Further Disposition and Control of Our Public Lands.

By F. W. MONDELL, *Former Representative, Wyoming.*

3.30 p. m.—Who Should Control Public Lands Which Contain Minerals?

By W. HALVERSON FARR, *Assistant Attorney General, State of Utah (tentative).*

4.00 p. m.—A Sensible Application of Our Anti-Trust Laws.

By JUDGE NATHAN B. WILLIAMS, *National Manufacturers Association.*

4.30 p. m.—Discovery as Applicable to Oil Shale Lands.

By DE LOS D. POTTER, *Denver, Colo.*

DISCUSSION.

Wednesday Morning, December 8

9.45 a. m.—Third Session of Convention.

(To be held in The Garden, Mayflower Hotel.)

TOPIC: "A Unified Labor Program."

Presiding Officer—MR. HARRY N. TAYLOR.

Introduction of Resolutions.

ADDRESSES:

9.45 a. m.—The Bituminous Coal Industry—A Unified Labor Program.

By Hon. J. J. DAVIS, *Secretary of Labor.*

10.30 a. m.—The Coal Labor Situation.

By J. G. BRADLEY, *Elk River Coal Company.*

11.00 a. m.—Labor Relations in Metal Mining.

By CLEVELAND DODGE, *Phelps Dodge Corporation.*

11.30 a. m.—Development of Non-Metallic Industries of the South.

By Dr. A. F. GREAVES-WALKER, *Dean of the State College of Engineering, North Carolina.*

DISCUSSION.

1.00 p. m.—Luncheon Board of Directors, The American Mining Congress, Jefferson Room, Mayflower Hotel.

Wednesday Afternoon, December 8

2.00 p. m.—Fourth Session of Convention.

TOPIC: "Stabilizing Mineral Production."

Presiding Officer—MR. SIDNEY J. JENNINGS.
Introduction of Resolutions.

ADDRESSES:

2.00 p. m.—Marketing May Revolutionize Coal Production.
By HARRY N. TAYLOR, *United States Distribution Corporation.*2.30 p. m.—The Zinc Industry.
By STEPHEN S. TUTHILL, *Secretary American Zinc Institute.*3.00 p. m.—A Stabilized Mineral Industry.
By ROBERT E. TALLY, *United Verde Copper Company.*3.30 p. m.—Promoting an Expanding Future for Copper.
By THOMAS DARCY BROPHY, *Member Advisory Board of Copper and Brass Research Association.*

DISCUSSION.

Wednesday Evening, December 8

8.00 p. m.—Adjourned Meeting, Members of The American Mining Congress.

Financial Report by Secretary.
Informal Discussion.

9.30 p. m.—Dancing and Informal Reception to Delegates, by Board of Directors, The American Mining Congress. (In the Grand Ball Room, Mayflower Hotel.)

Thursday Morning, December 9

9.00 to 10.30 a. m.—Visit of Delegates to the Income Tax Unit.

NOTE: Delegates are to assemble promptly at 9 a. m. at the Fifteenth Street entrance of Treasury Annex 2, below Fifteenth Street and Ohio Avenue.

10.30 a. m.—Fifth Session of Convention.

TOPIC: "Taxation."

Presiding Officer—MR. PAUL ARMITAGE.
Report—Committee on Resolutions

ADDRESSES:

10.30 a. m.—Lurking Dangers in State and Local Finance.
By L. R. GOTTLIEB, *Economist.* (Formerly of New York University, and the National Industrial Conference Board.)

11.00 a. m.—The Value of Taxpayers Associations in Solving State and Local Fiscal Problems.

By A. G. MACKENZIE, *Secretary Utah Chapter, The American Mining Congress.*11.30 a. m.—Waivers, Credits and Refunds.
By WALTER A. STAUB, *New York, Member General Tax Committee, The American Mining Congress.*

DISCUSSION.

2.00 p. m.—Luncheon and Entertainment for Visiting Ladies at the Congressional Country Club. Hostess: Mrs. J. F. Callbreath. (Guests will leave Mayflower Hotel by bus at 12.30 p. m. and drive to Club through Rock Creek Park.)

Thursday Afternoon, December 9

2.00 p. m.—Sixth Session of Convention.

TOPIC: "Taxation."

Presiding Officer—MR. S. PEMBERTON HUTCHINSON.

ADDRESSES:

2.00 p. m.—The Task of the Congressional Joint Committee on Internal Revenue Taxation.

By MCKINLEY W. KRIEGH, *Chief Tax Division, The American Mining Congress.*

2.30 p. m.—Discrimination Against Corporations Under Present Income Tax Rates.

By H. B. FERNALD, *Member General Tax Committee, The American Mining Congress.*

3.00 p. m.—The Function and Operation of the Board of Tax Appeals.

By HON. J. G. KORNER, JR., *Chairman, United States Board of Tax Appeals.*3.30 p. m.—Three-Minute talks by delegates on: "What Taxpayers think of the Present Income Tax Law and System of Administration."
Introduction of Resolutions.*Committee Conference Thursday Afternoon*

2.00 p. m.—Meeting National Standardization Division of The American Mining Congress. Reports of Committee's Discussion—Jefferson Room—Mayflower Hotel.

Thursday Evening, December 9

7.30 p. m.—Annual Banquet.

(In the Grand Ball Room, Mayflower Hotel)

Presiding Officer—MR. HUGH SHIRKIE, *President The American Mining Congress.*Toastmaster—HON. TASKER L. ODDIE, *United States Senator, Nevada.*

7.30 to 8.30 p. m.—Musical Selection—Mayflower Orchestra.

PROGRAM:

8.30 to 10 p. m.—Vocal Selections.

FLORA MCGILL KEEFER.

GEORGE WILSON, Accompanist.

ADDRESS:

NOAH SWAYNE, Philadelphia.

VOCAL SELECTIONS:

FLORA MCGILL KEEFER.

GEORGE WILSON, Accompanist.

10.00 p. m.—Dancing. (Music by the Famous Mayflower Orchestra.)

Friday Morning, December 10

10.00 a. m.—Seventh Session of the Convention.

TOPIC: "Elimination of Waste Through Standardization."

Presiding Officer—MR. W. H. LINDSEY.

ADDRESSES:

10.00 a. m.—Brief Review of What Has Been Accomplished Through Applied Standards.

By COLONEL WARREN R. ROBERTS, *Chairman National Standardization Division, The American Mining Congress.*

10.30 a. m.—Status of Mining Projects Now Before American Engineering Standards Committee.

By DEAN E. A. HOLBROOK, *State College, Pennsylvania.*

11.00 a. m.—Reducing Operating Costs Through Mechanical Avenues.

By EUGENE MCAULIFFE, *Union Pacific Coal Company.*

11.30 a. m.—Report on Western Division.

By IMER PETT, *Salt Lake City, Utah, Governor Western Division.*

11.45 a. m.—Report on Manufacturers Division.

By H. K. PORTER, *Hyatt Roller Bearing Company, Chairman of the Division.*

12.00 Noon—Mineral Development in the South.

By DR. HENRY MACE PAYNE, *Consulting Engineer, The American Mining Congress.*

Final Report Resolutions Committee.

Adjournment.

Correlating Committee Conference Friday Morning

11.00 a. m.—Meeting Mining Standardization Correlating Committee—Jefferson Room—Mayflower Hotel.



*Department of
Interior*



*U. S. Treasury
(National Photo)*



The U. S. Capitol



*President
Calvin Coolidge*



*Vice-President
Charles G. Dawes*

GOVERNMENT CONTACTS WITH MINING

Underwood & Underwood

Harris & Ewing

Federal Government In Its Dealings With Mining Industry Transacts Its Business Through Some Thirty Departments, Bureaus And Commissions—A Survey Of What Each Is Responsible For As Applied To Mining

GOVERNMENT contacts with the mining industry are veritably legion. There is scarcely a Federal agency that is out of touch with some of the many ramifications of mining. Some Government Bureaus, as for instance the Geological Survey, Bureau of Mines, Bureau of the Mint, and Bureau of Standards, were primarily organized by Congress to serve mining. While these Federal Bureaus are primarily devoted to promoting the welfare of the mining industry, there are others which act as a check.

A survey of the activities of the Federal Government in their relation to the mining industry reveals the following interesting data:

THE PRESIDENT

The President of the United States exercises a controlling influence on congressional legislation and administrative execution of policies affecting the mining industry. He consults with members of Congress and the heads of the Executive Departments as to measures to meet labor or economic situations arising in the industry. He also secures the views of mine operators and workers on governmental policies. His views are expressed in his annual messages to Congress and in public addresses.

STATE DEPARTMENT

Because of the large and increasing holdings of American mining interests in foreign lands, the State Department is regarded as the protecting arm of the

Government in preserving these rights from unlawful interference. When discriminatory laws are proposed in foreign lands to the detriment of American mining holdings, this department makes representations through its diplomatic representatives to the heads of the foreign governments concerned with a view to preserving the rights of Americans holding interests therein. Equal privileges to Americans in acquiring mining rights in foreign lands are also sought. During recent years the State Department has protested to Mexico and Rumania against mining and oil laws which are alleged to act in a discriminatory manner against American interests.

Through the consular service the State Department secures data bearing on the



Andrew Mellon, Secretary of the Treasury

economics of mining in the interest of the promotion of American trade.

Recently the State Department had charge of an international oil pollution conference designed to check the discharge of oil into ocean waters, and will participate in possible future conferences in this and other countries.

TREASURY DEPARTMENT

A number of bureaus in this department have close and vital contact with the mining industry. In fact it is closer to the pocketbook of the industry than any other Federal agency. The Internal Revenue Bureau and the Mint service are the outstanding branches of this department in their relation to the industry. The former collects Federal taxes from the mining companies, in which process it values its resources, and the latter purchases its gold, silver, copper and lead for the minting of the coin of the realm, and assays for prospectors their ore samples.

The Mint service operates mints at Philadelphia, New Orleans, Denver, Carson City and San Francisco, and assay offices at Boise, Deadwood, Helena, New York, Salt Lake and Seattle. The Secretary and Under-Secretary of the Treasury advise Congress as to revision of the tax laws. The Budget Bureau is the economy agency of the Government, scrutinizing and reducing expenses in the Government service. The Public Health Service makes investigations of pollution of streams by mine drainage, oil, etc.

WAR DEPARTMENT

While the War Department is primarily a military organization, it performs many useful engineering works for the

country. In peace as well as in war, this department purchases considerable supplies from the mining industry in the form of fuel and metals. Its technical bureaus conduct investigations along metallurgical lines in the manufacture of powder, explosives and military equipment. The Chemical Warfare Service experiments with various chemicals, and the Engineer Corps carries on various activities which vitally touch the mining industry. One of these duties is the observation of mine drainage and discharge of oil into streams. The improvement of rivers and harbors for the transportation of mining products is also under supervision of the War Department, its



Herbert Hoover, Secretary of Commerce

annual reports on waterway improvements being the most voluminous issued by any government agency. The department also supervises hydraulic mining in California. The War Department is also making a survey to insure in future wars adequate supplies of essential war minerals.

DEPARTMENT OF JUSTICE

Numerous activities of the Department of Justice touch the mining industry. The principal of these is the enforcement of the anti-trust laws, in which the department maintains a constant watch over activities of corporations in the mining and other industries to see that mergers, combinations and agreements are not made in contravention of law.

The Solicitor General represents the Attorney General in Government suits which reach the U. S. Supreme Court, while the preparation and prosecution of suits in the lower courts are handled by Assistant Attorneys General. One of

these is in charge of public land matters and handles all suits and proceedings under the public land laws to protect the Government's interests, involving water rights, oil lands, forest reserves, etc. There is also an assistant attorney general in charge of taxation and commerce, representing the Government in suits of this character. Another assistant attorney general represents the Government before boards of customs appraisers and the Court of Customs Appeals in cases involving the dutiability of imported merchandise. The Department of Justice also has Solicitors for the Internal Revenue Bureau, and the Treasury, Commerce, Labor, and Interior Departments, who pass upon questions of law in the administration of affairs of those departments.

POSTOFFICE DEPARTMENT

Under laws of Congress forbidding the unlawful use of the mails, the Postoffice Department maintains a constant vigilance against fraudulent mining security promotions.

NAVY DEPARTMENT

Both in the field of commodity purchase and metallurgical research, the Navy Department has close contact with mining. Millions of dollars worth of coal and oil are purchased yearly for the operation of the fleet, to say nothing of thousands of tons of metal products. The navy is having built an experimental metal-clad airship costing \$300,000, which may be the forerunner of increased use of this type of material for naval planes.

INTERIOR DEPARTMENT

To the prospector and mining pioneer in the western hills the Interior Depart-



Harris & Ewing Photo

James J. Davis, Secretary of Labor

ment has long been regarded as the one to which he could look for the most assistance from his Government, as in this department was located practically all of the Federal agencies with which he came in contact. But since the Bureau of Mines was transferred a year ago from this department to the Department of Commerce, the interest of the miner has been divided between these two agencies. The Interior Department has long been known as the "land department" as it handles practically all affairs relating to Government land holdings, both in the United States and Alaska.

One of the main bureaus of this department is the general landoffice which surveys, manages and disposes of public lands; adjudicates conflicting claims to land; grants railroad and other rights of way; issues patents for lands, including those containing minerals; in all of which activities it occupies an important position in relation to the mineral locator. Leases and other operations on mining lands of the Indians are handled by the Indian Bureau.

Since the transfer of the Bureau of Mines to the Department of Commerce, the Geological Survey has taken on added interest to the mining industry because it has assumed the supervision of operations under the mineral leasing law. The Survey classifies public lands as to their content, and examines the geologic structure, mineral resources, and mineral products of the national domain.

Since the close of the war the Interior Department, through a War Minerals Relief Commission has been adjusting claims under an act of Congress for losses incurred in producing or preparing to produce at Government request manganese, chrome, pyrites, and tungsten.

DEPARTMENT OF AGRICULTURE

Chemical investigations of benefit to mining are conducted by the Department of Agriculture, which also, through its



National Photo

The Department of Labor

Forest Service, regulates mining in national forests. The Forest Service also conducts important investigations and tests on timber in their relation to use in mines. The Bureau of Soils conducts investigations as to soil minerals and fertilizer resources, while the use of mine product chemicals as insect foes are studied by the Bureau of Entomology. The use of mine products in road construction and maintenance is under the jurisdiction of the Bureau of Public Roads.

DEPARTMENT OF COMMERCE

The mining industry's real bureau—the Bureau of Mines—is attached to the Department of Commerce. The Bureau was established on July 1, 1910, through concerted efforts of the mining industry, centered by the American Mining Congress. Before that time mining matters were under supervision of the Geological Survey. At first the Bureau was attached to the Interior Department but since July 1, 1925, it has been under the Department of Commerce. The transfer of the Bureau to the Department of Commerce was based on two reasons—economy in Government expense and co-ordination of work on mining matters by other bureaus of the Department, principally the Bureau of Standards, Census Bureau and Bureau of Foreign and Domestic Commerce. The work of the Bu-



Harris & Ewing, Photos

The U. S. Bureau of Mines. Above, The Department of Commerce



National Photo

Above, Home of the Interstate Commerce Commission. Below, Scene in a Coal Yard at Curtis Bay, Md. The Mining Industry Furnishes 58 Percent of the Freight Tonnage of the Country

reau is of a scientific, technologic and economic character, and is officially defined as follows:

The Bureau is charged with the investigation of the methods of mining, especially in relation to the safety of miners and the appliances best adapted to prevent accidents, the possible improvement of conditions under which mining operations are carried on, the treatment of ores and other mineral substances, the use of explosives and electricity, the prevention of accidents, the prevention of waste, and the improvement of methods in the production of petroleum and natural gas, and other inquiries and technological investigations, pertinent to such industries. The Bureau has charge of tests and analyses of coals, lignites, ores, and other mineral fuel substances belonging to or for use of the United States; the collection of statistics on the mineral resources of the United States;

and supervises work relating to the production and conservation of helium. It also has charge of the Government fuel yards for the storage and distribution of fuel for the use of and delivery to all branches of the Federal service and the municipal government in the District of Columbia and such parts as may be situated immediately without the District.

Every ten years the Census Bureau gathers and publishes complete information on the mining industry, covering production, employment and other data. Frequent reports on production, prices and stocks are issued for various industries.

Commerce secures trade reports through its agents in foreign lands, and maintains branch offices in important centers of the United States for the purpose of promoting the sale of American products



National Photo

The U. S. Tariff Commission

The Bureau of Foreign and Domestic Trade. It maintains commodity divisions under technical experts to assist basic industries in extending their for-

eign trade. These divisions cover minerals, coal, iron and steel, agricultural implements, chemicals, electrical equipment, and machinery. The Bureau also investigates foreign sources of raw materials essential to American industry.

The Bureau of Standards performs important work of a metallurgical nature for the mining industry. It determines the physical contents and properties of materials. It investigates mine scales and the conditions and methods used to weigh and measure coal in fixing wages, and in insuring accuracy in weights and measures at mines. It also investigates the economical and efficient use of fuel and lubricants in automotive engines. It tests stone, clays, cement, chemicals and other materials.

The metallurgical research of the Bureau covers researches in metals, including foundry practice, standards for metals, alloys, and sands; their properties and treatment; prevention of corrosion; development of substitutes for metals; behavior of bearing metals, preparation of specifications; investigation of new processes and methods of conservation in manufacture; and investigation of railway materials and causes of their failure.

Other investigations of the Bureau cover: standardization of equipment in which there is cooperation with the Government and with engineers and manufacturers in formulating standards of performance for instruments, equipment, tools, and other devices; formulation of

methods of inspection and of laboratory and service tests to insure compliance with specifications for quality and performance, and simplification of varieties of products; development of methods of testing and standardizing equipment used in mechanical, hydraulic, and aeronautic engineering; study of types of apparatus and methods of operation, and the establishment of standards of performance; determination of physical constants involved. In the field of industrial research the Bureau maintains technical cooperation with industries upon fundamental

research to promote industrial development and to assist in the permanent establishment of new American industries.

DEPARTMENT OF
LABOR

Maintenance of peace in industry through prevention of disputes between capital and labor and adjustment and settlement of strikes or controversies over wages, hours and working conditions is the aim of the Department of Labor. Through a Conciliation Service, the Department studies labor relations in the mining and other industries. Some of its conciliators are assigned especially to consider the labor situation in coal, copper, petroleum and other mining fields. Preceding wage negotiations between important groups in the mining industry, particularly anthracite and bituminous, the Department details its conciliators to the mining regions affected and to the scene of the wage parleys to be in a position to furnish, if requested, advice in the formulation of new contracts. Department officials in Washington are also kept posted by the conciliators on the developments in the situation. The Secretary of Labor and the chief of the conciliation service frequently enter the situation by visits to the scene of the parleys or the mine district affected, to gauge the drift of sentiment and to tender their good offices of mediation in case a deadlock in the negotiations ensues. Representatives of the parties affected in the controversy often consult officials here voluntarily or on request of the officials, who in turn keep the President advised when the situations reach an acute stage, as has been the case in recent coal strikes.

The Department of Labor also administers the immigration law.

Various statistical and other investigations concerning wages, hours of labor and living conditions in mining and other industries are conducted by the Bureau of Labor Statistics of the Department.

INTERSTATE COMMERCE

As the mining industry furnishes approximately 58 per cent of the freight tonnage of the country, it bears an important relation to the Interstate Commerce Commission. Mining men frequently appear before the commission in behalf of reduced freight rates on products of mines or in opposition to increased rates. The commission also exercises supervision over the furnishing of cars to mines for transportation of coal and other products. During emerg-



Chamber of the U. S. Supreme Court

National Photo

encies, such as coal strikes or fuel shortage in any locality, the commission issues embargoes to relieve freight congestion and priorities to expedite the shipment of coal or other products to essential industries or communities in special need. The commission also has supervision over carriers engaged in the transportation of oil by pipe line, rail or water. It also prescribes regulations for the safe transportation of explosives.

CIVIL SERVICE

Technical and other employees of the Bureau of Mines and other government services are recruited by the Civil Service Commission.

FEDERAL TRADE COMMISSION

The Federal Trade Commission is the successor of the old Bureau of Corporations, organized in former President Roosevelt's administration. The commission still maintains more or less of the investigating characteristics of the former bureau, but in recent years has endeavored to act principally as an advisory agent to business and not that of an inquisitorial agency. Most of the investigations conducted by the commission are in compliance with orders of Congress on particular industries and subjects. The other investigations instituted by the commission on its own motion are in the form of complaints against business for conducting unfair methods of competition in restraint of trade. The commission has instituted trade practice conferences, which result in decisions by groups of related industries to observe certain practices or to abstain from others. Instead of charging a business with law violation, the commission endeavors by conference to persuade the concern from continuing objectionable practices, failing which complaint is filed against the company.

The commission has not always been

friendly to mining, and the continuance of this attitude hinges on a decision of the U. S. Supreme Court which is looked for any day. The commission wants to compel corporations engaged in the iron and steel and coal mining industries to make to it periodic reports as to their detailed cost of operations and profits. The commission, or rather the commission members who initiated this program in 1920, say this information on basic industries is

necessary to a proper study of the cost of living, and essential as a basis for Congressional legislation. The mining industry is awaiting the decision of the court with interest as it is expected to decide whether or not the mining as well as iron and steel industry is subject to Government regulation and required to submit reports.

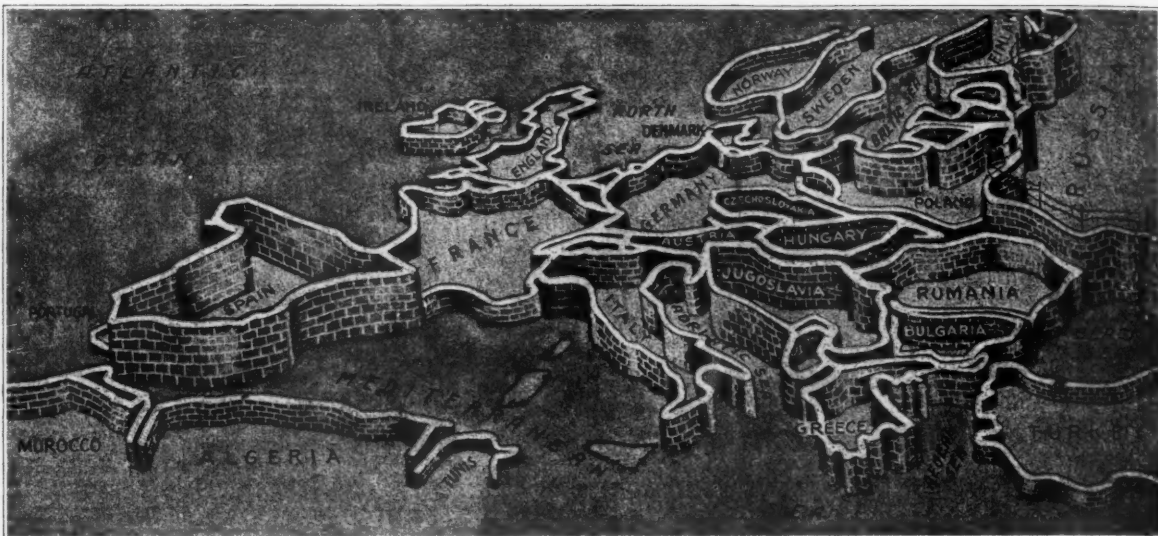
The commission also administers the Webb-Pomerene law, known as the export trade act, under which associations of producers of commodities may register for promotion of exports.

TAX BOARD

The mining industry has a vital interest in the Board of Tax Appeals which passes on appeals of mining companies from tax assessments of the Internal Revenue Bureau. The board in turn investigates all angles of the mining industry in order to base its decisions on depletion and other questions involved in cases brought before it by mining interests.

TARIFF COMMISSION

Intimate contact is had by the Tariff Commission with the mining industry, because of its investigations of mining products under the tariff law. The commission maintains for the use of Congress when called upon, a current survey of tariff information upon mining and other products. It also investigates the differences in cost of production in the United States and abroad of mining and other products. Based on these investigations, the commission recommends to the President the reduction or advance of the tariff by not more than 50 per cent of the present duty. Copper, magnesite, pig iron, and chemicals especially have been the subject of investigation by the commission. (Continued on page 880)



The Tariff Walls of Europe and Their Relative Heights

This large map of Europe, with national boundaries marked by tariff walls of varying height, was designed by Sir Clive Morrison-Bell, M. P., and reproduced in the Illustrated London News. The lowest walls are those around Great Britain, Northern Ireland, Holland, and Tunis. The highest is that around Russia, which is surmounted by barbed wire, suggesting, perhaps, the difficulty of any kind of trading with that country under Soviet rule. Russia's wall is seven times the height of Britain's, while Spain's is nearly six times, and Germany's three and a half times as high.

IS THE TARIFF AN ISSUE

Prosperity Bound Up In Principles Of Protection—Tariff Does Not Keep Out Aggregate Volume Of Goods But Limits Importation Of Home-Produced Products, Builds Internal Prosperity And Increases Volume Of Foreign Trade

By HERBERT WILSON SMITH*

IT IS easier to oppose than it is to espouse a cause. In the first place, it does not require so much constructive thought. We all enjoy more being "agin" something than to be enthusiastically in favor of something. The average citizen, therefore, feels the strength of his vote more substantially when he uses it to vote against an issue or its sponsor than when he uses it to vote for either. Political leaders of all parties have recognized this quirk of the human mind. Therefore, frequently an object of attack is set up to arouse the interests of the voters, rather than to raise a standard around which they may enthusiastically rally.

The prohibition campaign, for example, was conducted as a campaign *against* liquor traffic. The present moderation campaign is *against* Volsteadism. The national campaign of 1920 was *against* internationalism. An issue which may be used perennially as an issue for the people to be against has, so long as it may be made to endure, a large political value.

The issue which endured the longest in the United States in this role, undoubtedly, was the tariff. It furnished the battleground for many of our bitterest

political warfares for one hundred and fifty years. The benefits of an adequate tariff are summed up in general prosperity, and while direct in effect, this may be indirect many times, in application. It was also easy to point out particular tariff rates to convey the false impression that these rates actually constituted a tax which resulted in an increased cost of goods in the amount of rate levied.

Large groups of the people were indirectly benefited by the tariff. Other large groups, those which had the benefits of indirect protection, could easily be aroused by a showing of tariff levied. So the tariff became an issue for one hundred years or more.

The last two political battles in which the



Herbert Wilson Smith

tariff has been a major issue have been won by the proponents of protection. In 1896, "Protection" and "The Full Dinner Pail" were the slogans of the Republican party. On this platform they won. The political campaign of 1912 resulted in a victory for the opponents of protection not because of opposition to the tariff but because of the split within the Republican ranks themselves. In 1920 the tariff was again a major issue and the protectionists again won. In the campaign just closed, although the tariff was attacked in the beginning of the campaign by its opponents, it speedily appeared that the benefits which have come under the Fordney-McCumber Act have been so great that the tariff could not be made a satisfactory target.

Two documents have recently been presented to the public which may have a bearing on future tariff policy. The first is the recent propaganda emanating from England but having the support of a group of distinguished international bankers representing sixteen countries, including the United States, urging the reduction of tariff barriers. This propaganda took the form of a manifesto issued in London at first considered as intending to include the United States. It aroused a strong protest in this country.

* New York City.

Later it was stated to be intended to include only the countries of Europe.

This manifesto was accompanied with a graph showing the tariff situation by relative heights of walls. The tariffs of the British Isles are shown as the lowest. It may well be that there is room for a tariff reform in Europe. It may be that in the new alignment of national boundaries that barriers are set up which are disadvantageous to all the countries concerned. If this be the case, these countries should be the first ones to find it out

and correct the situation. The fact that the tariff walls of England are lower than those of other countries has no real bearing on the situation. The fact has been used as an argument against the tariff in the United States.

It is argued that as England prospers under free trade why shouldn't we? The prosperity of the British Isles, particularly of England, which means London, depends on as rapid a movement as possible of goods, money, credits and insurance in and out of London. If the United States consisted of the City of New York and its environs within a radius of one hundred and fifty miles, we would have a situation comparable to England. But it does not. We have a huge producing area in this country—an area whose production and whose manufactures must be protected. The British colonies do not adopt the policy of the mother country. Canada, Australia and the other British colonies have their high tariffs to protect their home industries. The industries of England which are not self reliant have been well protected by the Safeguarding of Industries Act.

When opponents of the tariff wish to arouse fear for its consequences, one of their favorite arguments is to suggest possible retaliations which may be inflicted by other countries. We might imagine from these statements that the United States was the only country which had a tariff. But bless us, when we look at the tariffs of other countries! Their schedules makes us feel most modest and unselfish. They make us think that we

might with entire justice revise all our own rates upward.

The United States has always had the policy of one tariff law, one set of rates and no discriminatory provisions. Discrimination against individual countries, preferment of individual countries and discrimination against geographical districts in the tariff law are impossible under the fundamental provision on which the tariff legislation of the United States must be based. Other countries almost without exception have one, two or three sets of rates by which they trade with countries whom they wish to favor or whom they wish to put at a disadvantage. Sometimes the alignments of countries which are to receive preferential treatment are set forth in the organic act itself. Sometime they follow the enactment of the act by a series of proclamations but always preferential treatment is subject to negotiation and favoritism.

The danger in the present proposal of the leveling of European tariff walls is that whether this proposal is to be directed against the United States immediately, the net ultimate effort will be to try to draw the United States into some such negotiations.

Both mining and agriculture, two industries long opposed to tariff largely because their products in former years did not receive adequate protection, are now vigorous proponents of a protective policy. These industries realize that they must have a fundamental protection on their own production and that they must have protected industries and

employed workers to whom to sell their metals and foodstuffs.

In fact the majority of the population of the United States is beginning to realize how thoroughly its prosperity is bound up in the principles of protection.

What is the purpose of protection? Is it a special favor to a restricted few, as has been charged? Emphatically not. A tariff is a form of protection provided by law. There are two types of protection—that protection afforded by geographic isolation, and that protection

which is only a poor substitute for the first, the protection afforded by law, a protective tariff.

Who gets the protection of geographic isolation? It is those very people who feel they have the least interest in protection. It is the people the product of whose labor is nontransportable. There are two types of labor, one the product of which is transportable and the other whose product is nontransportable. All professional men—lawyers, doctors, dentists, teachers, and similar professions—are in this group; the product of their labor can not be transported. Similarly in the skilled trades—builders, bricklayers—the product of their labor can not be transported. Hence, in their effort to earn a livelihood, these workers can not come into competition with the low-paid labor or the low-paid intelligence of foreign countries.

Let us illustrate: A bricklayer in New York can not come into competition with a bricklayer in Antwerp, because each must lay his bricks in his own city. But a brickmaker in New York comes into direct competition with a brickmaker in Antwerp just as soon as the brickmaker in Antwerp loads his bricks—that is, the product of his labor—onto a vessel and ships them to New York. Should the worker of whatever rank, who is so fortunate that the product of his work is permanently protected from the work of men of the same occupation in other countries, deny to the worker, the product of whose work must come into competition with the foreigner, that stop-gap modicum of protection which is afforded by a tariff law?



Henry Miller

Chinese Coolies

Americans Would Be Competing With Such Laborers as These If There Was No Tariff

World conditions have been urged repeatedly in the last few years as the basis for the necessity for lower tariffs in the United States.

Foreign debts to the United States must be paid in goods; the tariff shuts these goods out say low tariff supporters. Yet what are the facts?

In 1921 our imports were \$2,500,000,000. In 1925 over \$4,200,000,000.

Those very nations whose debts are the largest and who as debtor countries are raising this cry have the following refutation of their own theory:

IMPORTS INTO THE UNITED STATES FROM—		
	1921	1925
Great Britain	\$238,000,000	\$412,000,000
Belgium	35,000,000	68,000,000
France	142,000,000	157,500,000
Italy	62,000,000	102,000,000

And yet in face of these figures the bulletin on tariff revision recently issued by the Whaley Eaton Service states:

"The United States besides being, or on account of being, the wealthiest and one of the most highly industrialized nations, is the greatest consuming market in the world today. European production looks to it as to the Promised Land. But the gates are closed, or only so partly opened as to afford Europe nothing like the market to which she thinks she is entitled. The question is bluntly put by the debtor nations: 'If you expect us to pay these immense sums, you must take our goods. We can pay in no other way.' Another method of saying the same thing is: 'A modern nation can pay for large external borrowing only by creating an excess of exports over imports. This excess is the measure of its financial standing beyond its borders.'"

"One definite answer from America has been made to this argument. It is the so-called 'Hoover theory' of triangular trade. A better name might be 'Poly-angular trade.' However, reduced to its simplest form, the theory is stated:

"France must pay us \$10 this year. She has an exportable surplus of silk textiles and of wines. We refuse to take these commodities. France, however, can sell \$5 in wines to Brazil and \$5 in silk textiles to the Malay States. Brazil

sends us \$5 in coffee and the Malay States \$5 in rubber. These commodities we will take. The French debt to us is paid in this triangular way."

This tariff bulletin is the second of those documents designed to have an effect on tariff revision.

The statement quoted carries too much of the thought that tariff is acting as a barrier to square with the facts. The assumption that the triangular trade is the only way credits pass in satisfactory volume is futile in face of the facts of imports of \$4,200,000,000, and a doubling of imports from major debtor nations in the last five years.

Many misguided economists would have us believe that tariff protection means the shutting out of foreign business or the shutting off of our export business. It means neither of those things. It means, first, that the nature of the things that we import changes. It is better for us, for example, that we should import coffee and spices free of duty, and levy a duty on sugar which we can raise, because by thus changing the nature of the things that we import, we import the

things that we really need in greater volume, and because of our internal prosperity our external buying power is increased.

For example, under the Underwood Tariff Act, which was designated as non-protective tariff, there was imported into the United States \$1,892,954,876 in 1914; under a protective tariff in 1925 our imports were \$4,179,240,000. Our exports in the same years were, respectively, in 1914, \$2,218,580,200; in 1925, \$5,084,957,000. Now what do these figures tell us? They tell us that a protective tariff does not keep out the aggregate volume of goods, but merely limits the importation of those products which we can best produce at home, builds our internal prosperity, and increases our volume of foreign trade, both import and export.

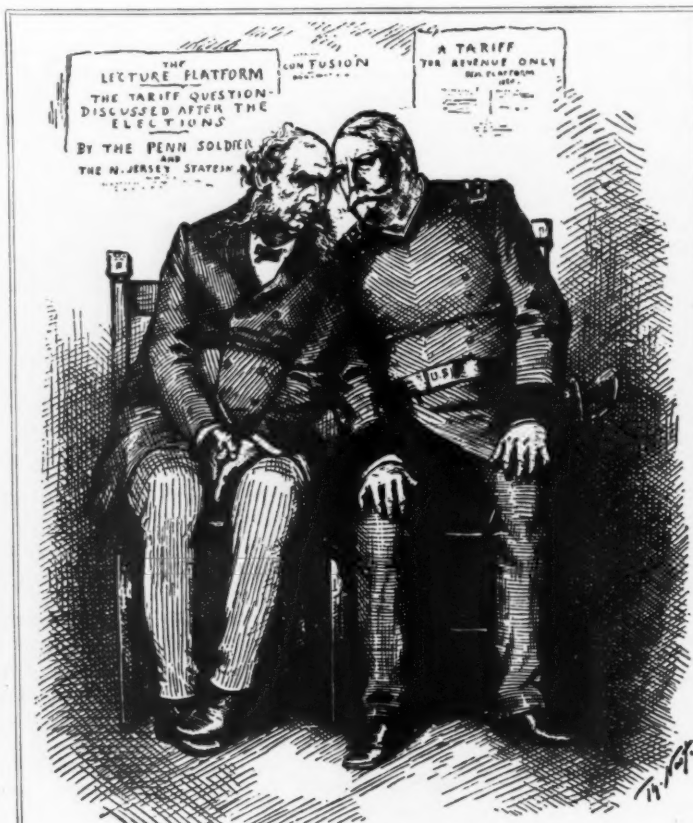
Our relation to world trade, commerce, and exchange of funds can not be correctly reckoned without taking into account our tourist expenditures. The greatest of world travelers, the American tourist, spends one billion dollars every year in foreign countries for living, personal service and goods.

Only a prosperous America can do these things and the sooner both American internationalists and the foreign protagonists, who would be broad-minded in our behalf, realize this, the quicker such fogs of misunderstanding will be dissipated.

The tariff as an issue against which our people can be aroused has passed. Its benefits are too apparent for any organized group of citizens large enough to constitute a majority to be "agin" it.

The first law passed by the first Congress of the United States in 1789 was a tariff law. Our national industrial and commercial development has been based on protection ever since. And as we as citizens become more intelligent we realize with increasing force that we have done pretty well.

The Department of Commerce has issued a bulletin on Asbestos, Sources and Trade, copies of which may be obtained from the Department for 10 cents.



"A Local Question"

"Who Is Tariff, And Why Is He For Revenue Only?"

A study of cartoons shows how the Tariff has always been an issue. This one by Thos. Nast appeared in Harper's Weekly and played an effective part in the campaign of 1880 between Generals Garfield and Hancock for the presidency. Reproduced by permission of Harper & Bros.

LABOR RELATIONS IN METAL MINING

Greatest Need Is Development Of Constructive Leaders—Mine Operator Of Today Must Be Educator As Well As Executive And Engineer—No Labor Troubles Of Importance—Relations Between Labor And Capital Excellent—Confidence In Each Other Increasing Steadily

By CLEVELAND E. DODGE *

AS metal mining of one kind or another is going on in all parts of the country, I will not try to cover the whole area but will confine myself to the district with which I am most familiar in Arizona and New Mexico. One point that should be remembered about mining operations is the fact that they do not make use of the very great numbers of employes which a large manufacturing business requires. It is further true that the operations in mining are usually more or less scattered in any one locality, so that there are not thousands of men working in one place, as in a manufacturing plant. Another feature which seems to me to be of advantage to the mining industry is the fact that most of the work, especially in underground mines, is far from being merely mechanical and requires a man

American and secondly, Mexican. There are few mines left where American labor is still employed, the notable examples being in the mines at Bisbee, at Jerome, and in the Old Dominion mine at Globe. Really the only other places employing this type of labor are in some of the smaller mines and prospects; in all the other large camps Mexican labor is used almost entirely, and this is also true of surface labor at Bisbee and Jerome. Several of the mines, such as the Miami and Inspiration, originally started by using American labor but within recent years have found it necessary to employ a large number of Mexicans underground, owing to a shortage of the other type of men.

Since the war years, when outside interference brought about several strikes, there have been no labor troubles of any importance. Upon the whole, the feeling that exists between labor and capital is excellent, and confidence in each other has been increased in a very satisfactory manner. Open shop practice prevails entirely throughout the mining industry in the southwest.

In the old days the operating officials in the mining camps used to handle labor in most cases in a very crude and rough way. This has entirely changed, so that at the present time the management of all the camps is devoting a great deal of attention and care to the many problems connected with the employes. Nearly all of the large companies have now developed employment departments organized in such a way as to provide a systematic and intelligent procedure for many contacts with labor.

I have been interested in a chapter headed "Mental Hygiene of Employers," appearing in a recent book by Mr. Sam Lewisohn. The point is well made that the greatest need in managing labor is to develop constructive leaders, rather than to concentrate discussion upon the rights of the two sides represented by labor and capital. It is undoubtedly difficult for an operating man who is worried by all sorts of other problems to devote sufficient thought to the handling of labor and to developing qualities of leadership in himself. This necessity, however, is becoming constantly more evident, and a first-class operating man of today can not afford to neglect this duty.

At our Copper Queen Branch at Bis-



to use his head and think of what he is doing. All these points tend to make a man working in a mine or a metallurgical plant feel that he is a real individual to a far greater degree than an employe in a factory. This is obviously of great advantage in dealing with labor questions, as it tends to make the employe do more thinking for himself, instead of being carried along by the thought of the crowd.

In Arizona and New Mexico there are two distinct types of labor—firstly,



Mexican Residence Section and Mexican Houses Erected by the Phelps Dodge Corporation at Tyrone, New Mexico

* Phelps Dodge Corporation.



Hospital, Tyrone, New Mexico

bee, Ariz., we have had for over five years a representation plan modeled after the Federal Constitution of the United States. A good deal has already been written about the plan, but the longer the period in which it functions satisfactorily, the stronger, of course, is our confidence in its permanent success. The plan provides for a legislative body consisting of two parts. The House of Representatives is composed of men chosen every six months at elections conducted by the employees, to serve for a term of one year. The electoral divisions are so arranged that every department of the operations is represented. Supervisory employees, such as foremen and bosses, can not vote or serve in the House of Representatives. The house assembles once a month, unless a special session is called by the manager. The other legislative body is called the Senate and is composed of members chosen by and from the foremen and bosses, who are elected in a manner similar to that used in electing the members of the House. The executive is represented by the management of the company, and there is a Supreme Court, consisting of one representative of the employees, one of the management, and a third who is required to be an outstanding citizen of the community, having no connection with the company. Functions of the Supreme Court are to decide the constitutionality of any measure and to consider appeals in all cases arising out of grievances between employees and those in authority over them.

The members of the House and the Senate attend meetings on company time, and no legislation can become effective until it has been passed by both houses and then approved by the manager of the company. If a measure does not meet with the approval of the manager, he is required to return it within 10 days, along with a statement of his objections. In this case the measure is reconsidered and may be passed over the manager's veto and become effective by a two-thirds' vote of both the House and the Senate.

This plan has not been changed since it was introduced, and over 500 matters

bearing on questions of wages, bonus, efficiency, standards, payments, working conditions, and safety have been investigated, discussed, and settled. The last time that the wage schedule of the company was revised the matter was referred by the management to both the House and the Senate, and the scale as adopted was worked out through this cooperative method in a way acceptable to all.



On the Golf Course at Tyrone

Especially since January 1 of this year, the officials of our company have made a determined drive to decrease accidents. The representation plan has decidedly helped at Bisbee in securing the cooperation of the employees. For instance, at the end of September one whole division of the underground mines had gone for four months without a lost-time accident. We do not consider that any particular

form for employees' representation is of great importance, but feel that some adequate method can be made most valuable.

The success of our plan has been directly due to the whole-hearted and intelligent interest shown by the manager of the company, as well as by Mr. Henrie, the manager of the labor department, and others who have been instrumental in directing the procedure. The interest of the employees themselves has been very real, and their many suggestions have been of immense benefit and assistance to the management of the company. A plan of this kind can only be made successful where the employees are of sufficient intelligence to manage their own part of the program and where there is mutual confidence existing between employees and management.

Our experience has been similar to that found in other places where representation plans are in force, in showing that the employees are especially interested in acting upon matters about which they are intimately concerned, such as working conditions or questions of discipline, but that they are quite ready to leave in the hands of the management the conduct of matters about which they lack knowledge and which they do not consider their job, as for instance purchasing, selling, and other similar duties. When responsibility is placed upon working men they tend to become conservative, often to a far greater degree than the management itself.

Mexican labor has become by far the commonest type in the states along the border. The Mexicans are absolutely necessary to the industries of these states, not only to mining, but to agriculture, railroads, and in fact everything else. The increasing proportion of Mexicans has been due directly to the fact that American labor has been becoming scarcer, so that if it had not been for the availability of Mexicans it is hard to imagine what would have happened to that whole section of the country. One advantage of this type of labor is that it is very sensitive to supply and demand and tends to regulate itself by more Mexicans coming across the border when



Public Plaza with Residence Section in the Background, Tyrone, N. Mex.

they are needed and by their returning when there is an oversupply. The whole situation is quite different from that where immigrants come from foreign countries to settle in the United States, with very little probability of their ever returning to the countries from which they have come. For this reason Mexican labor in the southwest does not create the difficult problems arising from other immigration, and in all that district I have never heard any expression of dissatisfaction on account of the prevalence of Mexican families.

None of the mining companies in the southwest has tried any elaborate representation plan for Mexicans. In the plan of our company at Bisbee there are numerous Mexicans included in various of the departments, but the backbone of the representatives are chosen from American employees. In the Mexican camps it is desirable to have some sort of committees to represent the employees, in order to afford an opportunity to hear grievances, as well as to interpret to the employees the policies of the company. It is usually preferable to organize such committees for purposes of efficiency and safety prevention or community interest, rather than directly to discuss grievances. We have found that Mexicans will take a great deal of interest in safety prevention and, especially during recent months, we have obtained some very gratifying results at our property at Nacozari, in Mexico. During one period the mine departments completed 30 days without a single lost-time accident, and during a longer period of four months the concentrator, power house, and surface departments worked without the occurrence of a lost-time accident.

As in the case of Americans, in dealing with Mexican labor it is fully as important for the management to give careful attention to the many administrative relationships within the mines and plants, in order to meet satisfactorily daily problems

COAL MINE MECHANIZATION

Millions of dollars have been spent in experimental work determining the adaptability of certain types of equipment to mining conditions, under the varying conditions found in the coal fields. The result of all this experimental work is unavailable to the industry. One district has not been able, therefore, to profit by the experience of another district, except as individual operators have exchanged experiences. When an operator decides to make changes in his methods of mining, it has been necessary for him to spend again the thousands of dollars already spent in experimentation. There is no authentic guide to help him select the equipment that by experiment has proved satisfactory under analogous conditions. This is particularly true when discussing mechanical loading.

Operators and manufacturers are convinced that there should be some unbiased agency that will make available accurate, reliable and intelligent information concerning every phase of mechanical equipment for coal production. They want information from the operator and from the manufacturer, told in the language of the operating man, to aid them in solving their production problems.

The agency selected is The American Mining Congress. This organization has for years been conducting work looking to simplification of mining methods and mechanical equipment through its Division of Standardization, and through its conventions and expositions for the practical operating official. The work will be taken one step further through investigations to be carried on under the auspices of the Standardization Division and published both through the Mining Congress Journal, and in condensed form as a reference volume.

The American Mining Congress has secured the assistance of Mr. Glenn B. Southward, Consulting Engineer, Elkins, W. Va., who has been connected with the mining industry and identified with its operating problems for many years. Mr. Southward will devote his entire time to investigative work, first for the Mining and Loading Section of the Standardization Division, under the direction of Colonel Warren R. Roberts, Chairman of the Division, and Dr. L. E. Young, Union Colliery Company, St. Louis, Mo., Chairman of the Mining and Loading Section.

Mr. Southward's work will be that of investigator, visiting the different districts, securing information and data from various operating companies, to be turned over to the Mining and Loading Section as the basis of their report and recommendations covering this subject. He will later direct his attention to other phases of operating problems, in cooperation with other committees of the Standardization Division.

The work will begin immediately. We bespeak for the Committee and Mr. Southward the earnest cooperation of the operating industry. We feel certain that the results of this work will prove of inestimable value both to the coal industry and the manufacturers of mechanical equipment for that industry.

as they arise. In all kinds of labor relations, in safety prevention work and everything of that sort, we have found that it is absolutely necessary for an interest to be created by the head officials of the company in such a way that it will permeate all through the organization.

Our company has always realized strongly the benefits to be obtained by various kinds of welfare work. At the same time we have considered that welfare work is a matter of secondary importance to the more fundamental questions of fair wages, good working conditions, and a "square" management. Personally, I feel that the best type of welfare work is to provide good housing conditions for employees. Possibly next should come the question of a good medical department and hospital. In our camps we have also tried to provide beneficial places in which the employees can spend their leisure time. These would include baseball parks, swimming pools, clubs or Y. M. C. A.'s, and other features of a similar nature. Experience has taught us that it is necessary to avoid paternalism by allowing the employees to take part in the management of all these activities so that they will feel responsibility for them.

From what I have seen of the mining camps in the southwest, I judge that upon the whole they can compare favorably with any other mining communities in the country. This is due to an increasing degree of interest being taken by the managements of the different companies and to high-grade operating officials on the ground. As I have indicated above, I feel very strongly that avoidance of labor troubles depends largely upon the intelligent daily administration of relations with employees, as well as in using foresight to as great a degree as possible in studying the different problems that arise from time to time. It is throwing an increasing load upon the operating man, as today he must really be
(Continued on page 859)

FEDERAL CONTROL—THE BUGABOO OF THE COAL INDUSTRY

What Stands Between Threats Of Legislation And Actual Governmental Control Of The Coal Industry—All Semblance Of A Republic Or Of A Democracy Must Totally Disappear Before It Can Possibly Happen

By GEORGE H. CUSHING

PERIODICALLY, some excited gentleman arises in Congress to propose that the Federal Government shall regulate the coal business. At times, some legislators become so excited that they propose that the Government shall seize and operate the coal mines—temporarily or, maybe, permanently. When they are not stirred quite so deeply—that is, when the current selling price of coal is low rather than high—they modify their suggestions; they propose a milder form of invasion. They advocate merely that the coal men be compelled to spread upon the public records the secrets of their business—that they consent to be pilloried in public places.

Between the first of January, 1919, and the first of July, 1922, there was but one period of three weeks during which one or more of these proposals was not being actively advocated by some governmental agency. Before and since that time, there were other occasions when the same questions were actively urged in various forms. On such occasions, the coal men have rushed to the defense of their independence. Nearly every man who amounts to anything in the coal business has taken part, at one time or another, in one of these furious arguments. Time after time, committees of important coal men have been assembled in formidable array to resist such aggressions. At one time, the four major subdivisions of the industry appointed a joint committee which remained in session for weeks. For 10 years coal has had its watchmen constantly on the ramparts.

For a sham battle—and it has been merely that—this 10-year campaign has been the most realistic performance on record. Those who proposed and sponsored the legislation have seemed to be in deadly earnest. They acted as though they believed the Government could do what they suggested. Those who have stood on the lines of defense have been as grim and determined as though their lives, their liberties and their fortunes were about to be taken; they struck the postures of men who were ready to die but would never surrender. And all told, this battle has cost, in recent years, a sum which does not fall under fifteen millions of dollars. It has consumed millions of hours of time of men who haven't a minute to spare. Still, there is not now and never has been any danger that the threatened thing could or would happen—that the Government

would actually get control of the coal business. There never has been any real danger that the Government would invade the privacy of a coal company, any more than it would invade the privacy of any other individual. Therefore, the discussion of this possibility has been—and continues to be—a sham battle. That is, before the Federal Government could seize the coal mines—even temporarily—and operate them and even before it could by force strip a coal man—the meanness of the lot—of the facts about his business it must, itself, change form and purpose. It must abandon every pretense to being either a democracy or a republic and must step out on the pages of history as the most perfect type of despotism that has ever been known. The excited gentlemen who have proposed the coal legislation would be the first to take up arms against the very thing that successful coal legislation would mean. The people of the United States might, when irritated, talk about such things but they would never stand for the actuality. But, before such a project ever could get to the people for their decision, the U. S. Supreme Court would stop it. These propositions are all perfectly obvious. They have all been known to every man who has taken any part whatever in the debate—even the proponents of the bills have known all about them. Every newspaper reporter who reported the feverish struggle has known that all of it was pure twaddle. Still, the sham battle has gone on and on and on. It has absorbed millions upon millions of dollars. It has consumed millions of hours of the time of men who should have been at home producing coal or in Washington trying to improve Government. It has kept lawyers busy. It has built up a whole long line of "experts." It has made the presses groan with the stuff—"stuff" is the proper word—that has been written on the subject. And, it has given the Rotarians, the Kiwanians, the Civitans and all the rest of them something to talk about. It has been a bugaboo—a ghost dance behind the nation's calico. It has been, at once, the most amusing and the most amazing farce that has ever engaged the attention of a great nation for so long as a full decade. But a farce it has been and a farce it remains.

Before any of us is tempted to go

through another such a silly and expensive campaign, suppose we take down the calico and get a close-up view of the "ghost" which is doing the dancing behind it. Suppose we inquire what are the prospects that we, as a nation, can do what is proposed. It will be assumed, probably, that at least the Government could demand that the coal industry surrender certain facts about the business—the cost of production; the amount of money invested; the selling price of the coal—hence the difference between the cost and the selling price and the number of tons of coal produced. It is thus assumed that the public records could be made to show, to the penny, how much every coal man made—or lost—and hence, precisely what his status, as to solvency or otherwise, was at any selected period. It seems obvious that if the Government can not go that far, it surely can go no further. Therefore, it may be said that the whole case for or against coal regulation and control will rise or fall on whether the Government can or can not demand and get coal information.

It is not, here, admitted that if the Government can compel the surrender of coal "facts" it can, automatically, go further. Instead the contention is that if the Government can not take the information about the property, it can not take the property itself.

The debate in Congress over the question of fact seizure has been red hot for a number of years—10 at least. At one time, one of the wisest men in the U. S. Senate was carried so completely off his feet by a bit of sophistry that he said, in a hearing:

"This information about coal is something which the Congress should have for its guidance when attempting to enact proper legislation. Do you mean to tell me that the Congress can not get any and all information which it wants and needs for that purpose? And, if Congress can get the facts by inquiries such as the one now in progress, does it not follow that it can also command the orderly assembly of that same information at stated intervals; keep always on hand an inventory of the coal industry?"

The whole project sounds plausible enough when you look at it in that way. Taking it for granted that the Congress has exactly the power which this Senator hinted at, many another advocate of regulation has touched off some such skyrocket as:

"If the coal industry voluntarily does

not surrender its facts—and show the people that it is in a mood to placate public opinion—the Government may be forced to take far more drastic action.”

Such a threat, of course, huddled the whole question whether the Government has any right to demand “the facts” about coal and discloses the Congress as already over in the pasture gamboling among the other possibilities—seizure and operation of the mines. But, before we follow the Congress into that interesting meadow, suppose we take another and more careful look at the first proposal—that the coal industry shall be compelled to surrender its facts.

In 1920 permanent fact finding as to coal was advocated strenuously. It was then said that the Government ought to know how much the coal men were making—presumably so that it could decide whether theirs was a “reasonable” profit. In the spring of 1926, when the last fact-finding bill was before Congress, it was said that the industry was losing money; that the Government should know the facts in order to put itself in position to prevent an upset of the whole economic structure of the country. A cold-blooded view of both contentions leads to this; it is not contrary to any law, in this country, to make a profit. It surely is not contrary to any law to lose money—if it is, we are a nation and a race of great sinners, of which this writer is the chief. Since the statutes are completely silent as to any prohibition against either profit and loss, there has never been any occasion for any statute which would measure either how much a man might make or might lose either on a single transaction or on a group of transactions. Therefore, it seems to be the case, still, that a man can make or can lose as much as he pleases and still be a law-abiding citizen. And, he can accumulate or dissipate a fabulous sum in one grand coup—like conducting a merger or making a raid on stock exchange—or he can pile it up a penny at a time—like running a chain of five and ten-cent stores or selling chewing gum at a penny a stick. And, so far as any law is concerned, a citizen may still either make or lose money on coal. To be specific, with a million tons of coal any citizen could have made a million dollars in 1920; he could have lost a million dollars on the same quantity in 1925 and whichever happened—the profit or the loss—was the private good fortune or the private grief of the financier, the merchant or the coal man. Thus, the mere making or losing of money is not even within the zone of the statutes—so long as either or both is done honestly.

The plain truth is that neither those who have proposed coal legislation nor those who have sponsored it have ever claimed that there was even any smell

of illegality in either making or losing money. While they have wanted to snoop the coal industry, therefore, they have not said that it was for the purpose of detecting any such “crime.” They were not proposing another rum squad designed to break up bootlegging. What they proposed was something entirely different—a mere adventure in supplying material to scandal mongers. Theirs was the lust for something to gossip about.

When a Federal agent rifles the private papers of a private business man for the mere purpose of supplying some racy subjects to the newspapers and platform performers, it is obvious that the Bill of Rights, written into the Constitution a hundred and more years ago is being overlooked.

Before the Government could seize the coal mine, it would have, somehow, to dispossess the present owner. There, again, the Constitution would stand militantly—not lie insensate—in the way. The Constitution provides that private property can not be taken at all except for public use—that is, for the use of the Government itself. Even then, it can not be taken until it has been appraised by the courts and paid for according to the appraisal. Despite this known truth, some gentlemen in Congress have talked as though this thing could be done over night, by some executive order—and that it could be done at wholesale. Instead, it would have to be done in single parcels—a few at a time—and the acquiring of each parcel would consume years of litigation. Also before any such litigation could stand for a single hour in any court, it would have to be shown that the coal was to be taken for a public use. Not one pound could be taken away from one private citizen in order to give it to another private citizen. To do any differently when dealing with coal would open the way for the Federal Government to take all the land on which New York is built and give it to the poor people in Arkansas—merely because they are poor. And the latter is clearly ridiculous.

Somebody would have to be sent into the mines to dig the coal. To explain the possibility, let us assume that the Congress decided to seize the mines because the miners were on a strike. Therefore, the seizure would be for the purpose of putting the mines back into production. But, before the men could be induced to return to work, they would have to be compelled to work or they would have to be paid whatever they demanded. Let us assume that the Federal Government should try to compel one single miner to go to work. Everyone knows that there would ensue, at once, a terrific clash between that individual and the Federal Government. The

case would go instantly to the courts. If the Federal Government should establish its right to compel, it follows that the miner would no longer be a free agent. Thereafter he would be a slave who worked at the command of another. Whenever that stage has been reached in this country, we will have repealed the 14th amendment to the Constitution. Thereafter, instead of having so many million negroes as slaves to Southern farmers, we would have a million coal miners who were slaves to the Federal Government. The opinion is here boldly ventured that no such thing will ever happen so long as the U. S. Supreme Court stands. If compulsion is not attempted but if the mines still are put in production, then the Government must pay the miners enough to induce them to go back to work. That is, the miners would be paid out of taxes. Thereafter the coal would be sold for what it would bring. The difference between the cost and selling price would be made up out of the public treasury—another case of the Railroad Administration. This would mean that we would have established the very system of subsidies which this nation has fought from the beginning. Before any such project is launched upon, it is here suggested—with proper modesty, and falteringly—that it would be far simpler and cheaper if the Congress should pass a resolution which would instruct the operators to pay whatever the miners demanded; to sell their coal for whatever they could get and to bill the Secretary of the Treasury for the difference.

If we once assume that the Federal Government is to try to force the production of coal, we must assume also that the Federal Government stands ready to maintain order in and around the mines. That is, if the Federal Government has power to do something, it has access to any means which are necessary to its doing. Therefore, if the Government has the power to operate a coal mine, it has also the power to maintain order in and around that coal mine. The Federal Government's instrument for the maintenance of order is the U. S. Army. Thus, if the Federal Government can step over into a sovereign state to operate a coal mine, it can send Federal troops into that state to maintain order. But, it is specifically provided that Federal troops shall not enter or even cross a state without the written consent of the Governor of that state. Federal soldiers can not operate within a state until the Governor has admitted that he is unable to maintain order and has called upon the President for help.

With the foregoing standing militantly between the passage of a congressional reso- (Continued on page 859)

LEGISLATIVE REVIEW

Short Session Of Congress Opens December 6—Much Business To Be Transacted Before Adjournment March 4—Silver Purchase Bill To Be Pressed—Silver Price Inquiry To Meet India Silver Situation

WITH only three months' time before it, Congress will be kept busy until March 4 in disposing of public business requiring its consideration during the closing session of the 69th Congress. The session will open December 6 and during the following 90 days much activity will mark the proceedings of the House and Senate and of its committees. Effort will be made to clear the decks of legislation pending since December, 1925, in order to allow the 70th Congress convening in December, 1927, to start with a clean slate. There will be a feverish scramble to put through bills, as when the gavels of the presiding officers fall at noon on March 4 all uncompleted legislation will be discarded.

President Coolidge will outline his views on what he expects Congress to do in the next three months, in his annual message the second day of the session. He is not expected to recommend any new proposals except one for a 10 or 12 percent refund on 1926 taxes paid in 1927. This proposal is likely to create considerable discussion in the field of tax revision. Business interests are organizing for reduction of the corporation tax and may not agree with the President's refund idea. The President, Treasury officials and some Congressional leaders are opposed to tax revision at the coming session, preferring to wait until the Congressional Tax Investigating Commission reports in January, 1927.

The President is likely to renew former recommendations for legislation, including lease of the Muscle Shoals, Ala., nitrate and power project, and perhaps coal legislation. Both Senate and House have before them a proposal to lease the project to the Muscle Shoals Fertilizer and Power Distributing Companies, action on which will be pressed at this session. Senator Norris (Rep., Nebr.) does not expect action on the project, however. Eastern and New England Congressmen are expected to renew their demands for coal legislation. The subject is likely to be considered by the House Committee on Interstate Commerce, which postponed action on the question until December after it conducted hearings last April and May. The Senate has a coal regulatory bill pending on its calendar.

Legislation for the return of property of enemy aliens seized during the war

will be pressed for passage. This matter has been considered by the Ways and Means and Interstate and Foreign Commerce Committees, the adjourned consideration from the last session having been renewed November 15.

Legislation for consolidation of railroads is also expected to receive consideration.

MINING BILLS

Various mining proposals are slated for consideration. These include action on a bill already passed by the Senate for the purchase by the Government of 14 million ounces of silver at \$1 per ounce to complete purchases under the Pittman act. This bill is before the House Banking Committee and its advocates will make every effort to have it reported and passed by the House.

Western Congressmen will urge an investigation by either regular or special committees of currency and exchange questions with particular reference to the possible effect on silver and other metal prices in connection with the proposal of India to sell in 10 years a supply of silver equal to the world's production for three years in connection with establishment of the gold standard.

As he resigned, the Senate and House dropped the trial of impeachment charges against Federal Judge George W. English of the Eastern District of Illinois, involving receiverships for bankrupt coal and mining companies. The Senate special session scheduled for November 10 was convened and adjourned promptly but did not develop interest in proposals for legislation for the December session as had been expected because Western Senators were not called in attendance.

Since November 8 the House Committee on Appropriations has been hearing Government officials in support of their estimates of appropriations for the new Government year beginning next July. House leaders plan to have that body pass all of these bills before January 20. Increased appropriations will likely be requested for the Bureau of Mines to permit expansion of its mine safety work.

If time permits, the public land laws may be revised upon recommendations to be submitted by the Interior Department, which has been investigating this subject in response to demands of Western States that they be given title to mineral lands in their land grants. A Congressional Commission which has

been investigating land grants to the Northern Pacific Railroad and the Senate Public Lands Committee which has been looking into administration of the public domain are expected to make reports which will refer to mining rights and mineral development.

Effort will also be made to secure a vote on the proposed power development project on the Colorado River.

Other mining proposals are expected to develop as the session progresses.

NEW SENATORS

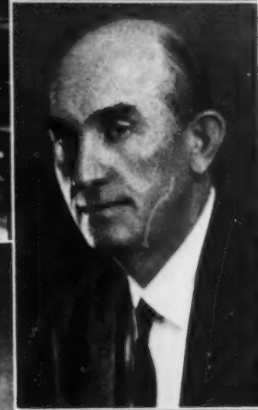
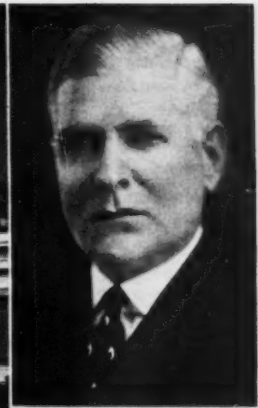
Several changes in the personnel of the Senate resulted from the November elections. Only three of the new Senators will take office immediately. The others will not begin their terms until March 4 and unless there is a special session of Congress, will not actively participate in legislation until the next regular session in December, 1927. Among the newly elected Senators are some who have served in the House of Representatives. The others will come direct from private life. They either defeated sitting members or succeed Senators who were not candidates for reelection.

From Alabama, Hugo Black, lawyer of Birmingham, will succeed to the seat voluntarily vacated by Senator Oscar W. Underwood, who will retire to private life March 4 after a continuous service of 20 years in the House and 12 years in the Senate. Mr. Underwood was a leader in both houses and was joint author of the 1913 tariff law. He has also been active in legislation to lease the Muscle Shoals, Ala., power and nitrate project.

Senator Ralph H. Cameron of Phoenix, who was Delegate in the House from 1909 to 1911 before Arizona became a State, and who urged a copper tariff in the last session, was defeated for reelection to his second term of six years in the Senate by Representative Carl Hayden of Phoenix, who has been a member of the House for 16 years.

Senator T. H. Caraway of Arkansas, was reelected as was also Senator Samuel M. Shortridge of California. The latter has been conspicuously active in behalf of legislation beneficial to the mining industry.

Charles W. Waterman of Denver, who has been attorney for the President's Oil Conservation Board, will succeed Rice W. Means, who failed of re-election.



Senator Hiram Bingham was reelected from Connecticut.

Senator Duncan W. Fletcher, of Florida, was reelected for his fourth term, and Senator Walter F. George, of Georgia, for his second term.

Senator Frank R. Gooding of Idaho, was returned to the Senate for a second term.

Frank L. Smith will succeed Senator William B. McKinley from Illinois.

Senator Arthur R. Robinson, who has been temporarily serving since October, 1925, by appointment of the Governor, was elected for the term ending March 4, 1929. Senator James E. Watson, Republican Whip of the Senate, who has served 12 years in the House and nine in the Senate, was reelected for a six-year term.

David W. Stewart was elected Senator from Iowa for the unexpired term of the late Senator Albert B. Cummins, who died this summer. He will serve until March 4. For the six-year term beginning March 4, Smith W. Brookhart was elected. He has twice before been elected, once for a short and again for a long term, and was unseated at the last session and replaced by Daniel F. Steck.

Representative A. W. Barkley, a leader in the fight for abolition of the Railroad Labor Board and its substitution by a new Board of Mediation, will suc-

ceed Senator Richard P. Ernst from Kentucky. Senator Ernst was a member of the Couzens Committee which investigated the Internal Revenue Bureau, and made a minority report defending its settlement of mining and other tax cases.

Republican leader of the Senate, Charles Curtis of Kansas, was reelected. Senator Curtis has served 16 years in the House and 18 in the Senate.

Senator Edwin S. Broussard

New Faces in the Senate

Left, upper, Hugo Black, Alabama (Henry Miller photo), and below, Charles W. Waterman, Colorado. Right, top to bottom, Elmer Thomas, Oklahoma; Carl Hayden, Arizona; M. E. Tydings, Maryland, and W. S. Vare, Pennsylvania. Center, left to right, F. L. Smith, Illinois; A. W. Barkley, Kentucky; Frederick Steiwer, Oregon (Henry Miller photo), and, below, H. B. Hawes, Missouri. In the center, the Senate Chamber (National photo)

Photos by Harris & Ewing unless otherwise specified

was reelected from Louisiana for a second term.

Representative Millard E. Tydings, who has served four years in the House, will succeed Senator O. E. Weller from Maryland.

COAL LEGISLATION ADVOCATE

In Massachusetts, Senator William M. Butler, chairman of the Republican National Committee, who has been serving since 1924 by appointment of the Governor in succession to the late Senator H. C. Lodge, is succeeded at once by Ex-Senator David I. Walsh, for the term ending March 4, 1929. Senator Walsh was defeated two years ago after serving one term, during which he investigated the coal industry as a member of a Senate Committee and urged regulation of the industry.

Senator George H. Williams of Missouri, who has been serving since 1925 under appointment of the Governor to succeed the late Senator Spencer, will be replaced at once for the term ending March 4, 1927, by Representative Harry B. Hawes, who has served six years in the House. Mr. Hawes will also serve for the six-year term following.

Senator Tasker L. Oddie, was reelected from Nevada.

In New Hampshire, Senator George H. Moses, was reelected.

Senator James W. Wadsworth, Jr., who has served 12 years in the Senate, will be succeeded by Supreme Court Justice Robert F. Wagner from New York.

Senator L. S. Overman was reelected from North Carolina for a fifth term.

In North Dakota, Senator Gerald P. Nye, who has been in the Senate one year by appointment of the Governor, was elected for the term ending March 4, 1927, and for the six-year term following.

Senator Frank B. Willis of Ohio, who served four years in the House, was reelected.

Senator John W. Harreld of Oklahoma, who served one term in the House, will be succeeded by Representative Elmer Thomas. Senator Harreld has been a strong defender of the oil industry.

In Oregon, Frederick Steiwer was elected to succeed Senator Robert N. Stanfield who has served one term.

Senator George Wharton Pepper of Pennsylvania, will retire from the Senate on March 4, after five years' service and be succeeded by Representative William S. Vare, who has served 16 years in the House.

Senator Ellison D. Smith was reelected from South Carolina for a fourth term.

Senator Peter Norbeck of South Dakota, was reelected.

Senator Reed Smoot of Utah, was reelected for a fifth term. Senator Smoot,

as chairman of the Senate Finance Committee, handling tariff and tax bills, has shown an active interest in the mining industry.

Senator Porter H. Dale of Vermont, who has served three years in the Senate and several years in the House, was elected for a six-year term.

Senator Wesley L. Jones of Washington, who has served 10 years in the House and 18 in the Senate, was reelected.

Senator Irvine L. Lenroot of Wisconsin, will be retired March 4, after 10 years' service in the House and nine in the Senate. He will be succeeded by John G. Blaine, whose term as Governor of Wisconsin expires in January.

NEW HOUSE MEMBERS

The election also resulted in many changes in the membership of the House effective after March 4. Lewis D. Douglas, son of James Douglas, the copper mine operator, will be the new Representative from Arizona, succeeding Representative Carl Hayden, who has been elected to the Senate. Two California Representatives—Walter F. Lineberger, and John D. Fredericks—will be missing, as Lineberger was an unsuccessful senatorial candidate and Fredericks was not a candidate for reelection to the House. The new California Representatives will be W. E. Evans and Joe Crail.

One of the present Representatives from Florida—John H. Smithwick—was defeated for renomination and he will be succeeded by Tom A. Yon.

Georgia will have two new Representatives, L. J. Steele and M. C. Tarver, as William D. Upshaw was defeated for renomination and Gordon Lee was not a candidate for reelection.

In Illinois, J. J. Gorman will be succeeded by J. T. Igoe; J. T. Buckbee will succeed the late C. E. Fuller; H. W. Hill will replace Frank H. Funk who was defeated for renomination; and J. E. Major will succeed L. E. Wheeler.

In Kansas, J. N. Tinchin was not a candidate for reelection and will be succeeded by C. R. Hope. U. S. Guyer will replace C. E. Little.

In Kentucky, W. V. Gregory will succeed A. W. Barkley who was elected to the Senate. Ben Johnson and A. B. Rouse were not candidates for reelection and will be succeeded by H. D. Moorman and Ora Ware. A. J. Kirk will be succeeded by Mrs. J. W. Langley, wife of former Representative Langley. Representative John W. Robison, chairman of the House Mines and Mining Committee, was reelected.

Representative John Phillip Hill of Maryland will be replaced by V. L. Palmisano as he was an unsuccessful senatorial candidate. W. P. Cole will succeed M. F. Tydings, who was elected to the Senate.

Frederick W. Dallinger will return from Massachusetts to succeed a deceased member. Mr. Dallinger previously served in the House, retiring two years ago to run for the Senate, but failed of the nomination.

In Michigan, John B. Sosnowski and Frank D. Scott were defeated for renomination. They will be succeeded by R. H. Clancy and F. P. Bohn.

Oscar E. Keller was defeated for renomination from Minnesota and will be succeeded by M. J. Mass. Representative K. Wefald will be replaced by C. G. Selvig.

In Missouri, Representatives C. A. Newton, R. E. Bailey and H. B. Hawes were not candidates for reelection. Mr. Hawes was elected to the Senate. They will be succeeded by H. F. Niedringhaus; J. F. Fulbright, and J. J. Cochran. E. C. Ellis will be replaced by G. H. Combs, Jr.; and C. E. Kiefer by Clyde Williams.

In Nebraska, J. N. Norton will succeed M. O. McLaughlin.

In New Jersey, Representative F. F. Patterson, Jr., was defeated for renomination, and will be succeeded by C. A. Wolverton. Representative S. H. Appleby was not a candidate for reelection and will be succeeded by H. G. Hoffman. H. W. Taylor will be replaced by P. J. Moore.

MINE MAN FROM NEW YORK

In New York, Representative William E. Cleary was not a candidate for reelection and will be succeeded by P. J. Carley. Representative Harold S. Tolley will be succeeded by Former Representative John D. Clarke, attorney for mining interests. N. D. Perlman will be succeeded by W. J. Sirovich. W. W. Cohen will succeed Ogden L. Mills, who was an unsuccessful candidate for Governor of New York. B. L. Fairchild will be replaced by J. M. Fitzpatrick.

In Oklahoma, Representative Charles D. Carter was defeated for renomination and Representative Elmer Thomas was elected to the Senate. They will be succeeded by Wilbur Cartwright and Jed Johnson. E. B. Howard will replace S. J. Montgomery.

In Pennsylvania, Representative W. S. Vare was not a candidate for reelection, being elected to the Senate, and Representatives E. N. Carpenter and G. F. Brumm, members of the House Mines and Mining Committee; H. J. Bixler and J. W. Magee were defeated for renomination. Representatives C. J. Esterly, J. W. Swartz, A. H. Walters, W. I. Swoope and T. W. Phillips, Jr., were not candidates for reelection. Their successors will be J. M. Hazlett, J. J. Casey, C. M. Palmer, T. C. Cochran, H. A. Estep, R. G. Bushong, I. H. Doutrich, J. R. Leech, J. M. Chase, and J. H. Swick. W. R. Coyle will be succeeded by Everett Kent. (Continued on page 870)

TOPOGRAPHIC MAPPING AND ITS RELATION TO REVIVAL OF WESTERN MINING*

Research Combined With Topographic Mapping Will Be The Basis Upon Which The Mining Industry Of The Future Rests—Mapping Program Has Dragged Along For Forty Years Due To Passive Interest—Western States Show Very Small Percentage Of Area Mapped

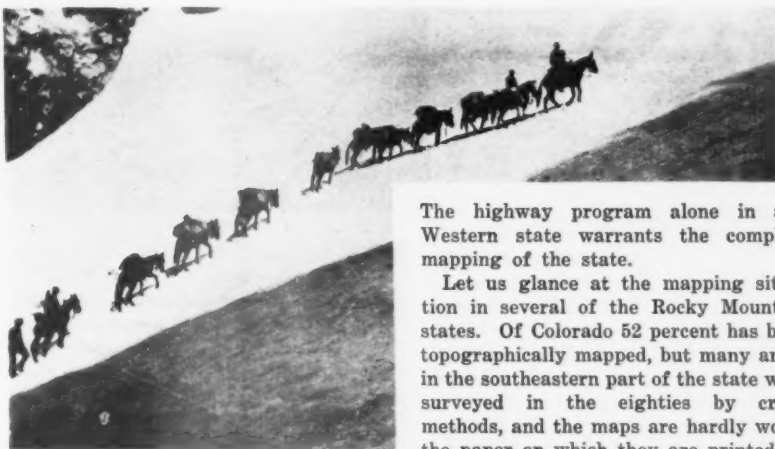
By C. H. BIRDSEYE†

THE first sentence in the official announcement of this convention states that "throughout practically all of the Western states during the past year there has been a most decided revival of mining activity." The first word in the next sentence is "research," and I believe that on this one word hinges the future development of mining. Is the revival temporary, or will development slump next year or the year after? Of course no one can answer that question, for many economic conditions affect the mining industry. But one thing is certain, and that is that unless we continue to invest in the future by properly coordinated research there will be another slump in the mining industry. The time has passed when a prospector can go out and find a rich property from surface indications. Now the wise operator will not move without the advice of trained geologists and mining engineers.

Some of you may wonder what topographic mapping has to do with this research. My answer is that a good topographic map is as essential to the work of a geologist as plans are to a builder. If a good map of the region to be investigated by the geologist is not available he must do one of three things—make one himself, thus diverting his energy and time from his geologic studies to work outside his special field; make a superficial investigation based on inadequate geographic data; or delay his investigation until a suitable map can be made by trained topographic engineers. All of these are wasteful and may result in large economic loss.

The chief geologist of the Geological Survey is authority for the statement that when a geologist must carry control surveys and make his own topographic base maps as much as 75 percent of his energy may be expended in this task, leaving but 25 percent for the work for which he is trained and engaged. Dr. I. C. White, state geologist of West Virginia, who was the first man in this country to apply the structural theory of oil deposits, is a firm believer in the value of topographic mapping, so much so that his state has been

mapped and remapped, and we are now revising some of the maps by a third survey.



I have heard one or two oil geologists say that they did not need topographic maps, but all that they needed was elevations. Now what is a topographic map but a systematic record of elevations? A few bench marks strung along a road are not going to help an oil geologist except by furnishing him data from which to run additional levels in areas where he wants elevations, and when he finishes that work he would have a fair topographic map if he took the trouble to sketch the surface contours. My best answer to this assertion is the fact that we can not keep our young topographers on the Federal Survey, and most of those who leave go into topographic work for oil companies.

Topographic maps have many uses. They serve as a base on which most problems involving the use of the land may be studied and plans may be made for their solution. But I am not going to discuss any of the uses of topographic maps other than for geologic base maps, except to point out the fact that once an area is properly surveyed and the resulting map is made available for public use, it has many other uses which undoubtedly will benefit the mining industry. The question of transportation alone is vital to any mining operation, and if a new ore body is located a road or railroad must be built to get material in and the ore out. Other benefits too

numerous to mention result from this accurate portrayal of the surface of the land. With a topographic map at hand an engineer can sit at his desk and plan improvements of many kinds without making preliminary field investigations.

The highway program alone in any Western state warrants the complete mapping of the state.

Let us glance at the mapping situation in several of the Rocky Mountain states. Of Colorado 52 percent has been topographically mapped, but many areas in the southeastern part of the state were surveyed in the eighties by crude methods, and the maps are hardly worth the paper on which they are printed, so that less than 40 percent of the state is adequately mapped. I would hesitate to attempt any engineering work with the map of Denver and vicinity for example. Wyoming is only about 30 percent mapped, but most of the existing maps are fairly adequate for modern uses. Utah is less than 22 percent mapped and New Mexico about 33 percent, but large areas in both of these states are covered by maps about as out of date as those in southeastern Colorado.

Now, what is a logical and economical program? In the first place, the maps are needed now—in this generation and not simply 50 years or more hence. At the present rate of progress it will be more than 50 years before some of the important areas in these states are mapped.

The mapping program has dragged along for 40-odd years, owing to passive interest in the project and the resulting inadequacy of appropriations. However, the situation is now much improved. Since the World War most of the engineering organizations in the country and many other groups of map users have expressed an active interest in topographic mapping, and as a result Congress passed the Temple Act, authorizing the completion of the topographic mapping of the United States in 20 years. Nevertheless, this act contemplates cooperation on the part of the

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†Chief Topographic Engineer, United States Geological Survey.

several states, and some of them seem to believe that by withholding financial assistance the Government will do all the work at Federal expense. Large areas in the four states I have mentioned are covered by national forests, Indian reservations, and national parks. The suggestion has been made that the states should pay half the cost of mapping these Federal reservations. The fairness of this suggestion is debatable, but certainly the states should share the expense of mapping the lands outside of these Federal reservations in the development of which they are primarily interested and from which they receive taxes.

These four states have contributed very little to the cost of the mapping done thus far. Wyoming and New Mexico have paid none of the expense. The only cooperation in Utah has been that in effect since the war with the counties in the Great Salt Lake basin. The Geological Survey has spent several hundred thousand dollars on topographic mapping in Colorado, but prior to 1923 the state gave us practically no financial assistance. However, beginning with the fiscal year 1924 a progressive mapping program has been in force with allotments of state funds that have enabled the Geological Survey to make material progress toward completing the mapping of Colorado. This cooperation has received the hearty support of the officials charged with the state's interest in the program—from the state engineer during the fiscal years 1924 and 1925—from the state inspector of oils during the fiscal year 1926, and from the president of the Colorado School of Mines during the current fiscal year. All of this cooperation has been largely due to the efforts of the Colorado Metal Mining Board, ably assisted and advised by the chairman of this meeting.

The immediate future of mapping in these Western states is contingent on state cooperation. The Geological Survey is now cooperating with 25 states, but 19 of them are east of the Rocky Mountain front, so that the East is getting most of the Federal money available for mapping. The situation is obvious. If the mining industry in the Western states needs topographic mapping and wants to take advantage of the corps of trained topographic engineers of the Geological Survey, it will be necessary to arrange cooperation by the states through some official agency. The Geological Survey does not urge any state to cooperate. The decision rests with those interested, and the Geological Survey stands ready to help if its services are desired.



You may be interested in a brief statement of the cost of topographic mapping. Naturally the cost of such work depends largely on the scale and contour interval of the maps and the character of the country. The Geological Survey has adopted three standard scales for maps of regions of varying importance:

1. Surveys of areas in which there are problems of great public importance—relating, for example, to proved mineral development, irrigation, or reclamation of swamp areas—are made with sufficient accuracy to be used in the publication of maps on a scale of 1:31,680 (1 inch = one-half mile), with a contour interval of 1, 5, or 10 feet.

2. Surveys of areas in which there are problems of average public importance, such as most of the basin of the Mississippi and its tributaries, are made with sufficient accuracy to be used in the publication of maps on a scale of 1:62,500 (1 inch = nearly 1 mile), with a contour interval of 10 to 25 feet.

3. Surveys of areas such as much of the mountain or desert regions of the West are made with sufficient accuracy to be used in the publication of maps on a scale of 1:125,000 (1 inch = nearly 2 miles), with a contour interval of 25 to 100 feet.

Topographic mapping in the Western mountainous regions is usually more expensive than that in the lower and relatively flat areas of the East. In these Western states maps for publication on the scale of 2 miles to the inch will cost on an average \$20 a square mile, or about 3 cents an acre. Maps for publication on the scale of 1 mile to the inch will cost about \$40 a square mile,

or a little more than 6 cents an acre. Maps for publication on the scale of half a mile to the inch will cost about \$80 a square mile, or about 12 cents an acre. The mile to the inch scale is recommended for most regions of promising mining development, the smaller scale for exploratory work in less promising regions, and the larger scale for small areas of proved mineral value. In work on any of these scales approximately 15 percent of the cost is expended for triangulation or other horizontal control, 10 percent for spirit leveling, 50 percent for field mapping, 15 percent for office computations, office drafting, and reproduction, and 10 percent for administration and inspection.

In all of its cooperative work the Geological Survey furnishes instruments and technical equipment and engraves and prints the maps without any charge to the cooperating state. Advance copies of the maps are made available for distribution soon after the field work is completed, and at all times cooperating officials have access to the field sheets or office records for examination.

No discussion of topographic mapping is complete without mention of aerial photography. Not long ago one of our conservative dailies carried the astonishing headlines, "Flyers to Map Whole U. S.—Ground Survey Costs \$50 a Mile and Photographic \$16." This was too good to be true, but further reading showed that aerial photography was not to replace ground surveys entirely but only aid them, expedite them, and cheapen the cost of the finished product.

There are regions where the use of aerial photography will eliminate most of the ground-survey work. In flat areas that are open or not too densely timbered, such as the marsh lands in the deltas of some of our southern rivers, there are no roads, trails, or houses, and a single determination of elevation may be sufficient to contour a large region. In mapping our large cities the use of aerial photography is of tremendous value. In the revision of old surveys made necessary by changes in the work of man aerial photographs may make it possible to publish an up-to-date map without the necessity of any resurvey by ground methods.

However, the whole of the United States will not be photographed for many years—probably never, at least for use in mapping. In certain areas the photographs would be of so little help to the map maker that the expense of making them would not be warranted for the purpose of map making alone. Any densely timbered area in the ever-

green forests of the Northwest presents an example of conditions that are most unfavorable to photographic surveying, either from the air or from ground stations. The meanders of the streams would, of course, be indicated on the pictures, but the topographer must traverse these streams to determine their fall, measuring accurately differences of elevation, particularly where possibilities of power development exist. The topographer must locate every trail and house and must tie his surveys to the section and township corners of the public-land survey. The pictures can not show these features in such an area, and new processes must be perfected before aerial surveys will be of much help to topographic mapping in our dense forests.

In country of considerable relief the use of aerial photographs is of doubtful value in connection with small-scale topographic mapping. For example, in the high Rocky Mountains the scale usually employed by the Geological Survey is 2 miles to the inch, and surveys by ground methods cost about \$20 a square mile. An aerial photograph is but a perspective view from the lens of the camera, and every plane of elevation in a single picture will, of course, have a different scale. These differences in scale can be coordinated, but the process is laborious and expensive, and with present developments the cost of taking the pictures and rectifying the photographic data may exceed the cost of a ground survey. Moreover, the use of photographs of such a region requires an abundance of control points accurately located by triangulation, an operation performed by the topographer in the course of his ground survey. The topographer has to climb all over the region in any event, not only to make the control surveys but to make the connections with the public-land lines.

Up to the present time no practicable method has been devised for determining elevations and portraying contour lines on small-scale maps of large areas by the use of aerial photographs. Some who are familiar with developments in mapping from photographs may challenge this statement, but I have followed these developments as closely as opportunity permitted and know of but one firm in the United States which has successfully solved the problem of the accurate portrayal of contour lines from aerial photographs, and this only in surveys on a very large scale.

Aerial photography is welcomed as promising to supplement ground surveys, and yet it does not promise to replace them to any large extent, particularly in the western mountain States. Last year the Navy Department and the

Geological Survey spent considerable money in making aerial photographs of an area adjacent to the naval oil-shale reserve near Grand Valley, Colo. Our field surveys were completed before these pictures were available, and about the only use we were able to make of them was to inspect and check the field mapping. On the other hand, we have mapped hardly a square mile in Texas during the last two years without the aid of aerial photographs and have been able to save about 30 percent in the cost of our mapping operations there.

Aerial photography has passed the experimental stage, and future improvements in apparatus and methods promise a much larger use of cheaper work than is now possible. It will pay to use this new method when and where the map data can be gathered by it at a less cost than by surveys on the ground. It will not pay when and where the expense of taking the photographs and of reducing the data is greater than the cost of collecting the information from ground surveys. The Geological Survey will use aerial photography where it pays and will not use it when the evidence indicates that it will not save time and money.

It has been our experience that as fast as improvements in methods and instruments which might be expected to cheapen the product are devised there has arisen a demand for more detailed maps, and the increased cost of meeting this demand has offset the saving made by the new methods. So the topographic surveys now in progress in the United States may be expected to yield better maps rather than cheaper maps because of this new aid to the topographic engineer.

THE BUGABOO OF COAL

(Continued from page 853)

lution to seize the coal mines and the actual production of coal it becomes plain silly to assume that any such enterprise could ever be carried into effect without destroying our whole present scheme of Government. Of course, that never will happen. Laying aside the bugaboo, there is another "fact" which causes the whole project to take its place among the ridiculous fumbblings of uninformed minds. That is, there is one way of measuring our national wealth in coal which yields some such result as the following: If it were possible to reduce our total deposit of coal to a state of flux and then to mould it into one basin having an even thickness of five and a half feet, that basin would extend over an area of about 2,773,000 square miles. As compared with this vast expanse of coal, the "average" coal operator controls less than one-half of one square mile of coal.

That suggests this simple question: If we want coal, why is it necessary to run the risk of the whole Government while we try to seize the few mines which are now in existence? We could get millions of tons of coal by opening some of the thousands of possible new mines. But, if we do not want to wait until that can be done we might still get the coal by giving our orders, our transportation and our financial encouragement to the non-union mines which remain in operation and which are eager to produce and sell their coal.

It is obvious from all that has just been said that the Federal Government can not seize a single coal mine without dispossessing the owner of it. That can not be done without putting a cloud upon the title to every piece of real estate in the union because what can be done with a coal mine, can be done with the land on which is located, a peanut stand or the Woolworth Building. The Government can not compel a coal miner to work without making a slave of him. And, if it can make a slave of a coal miner, it can also make a slave of the farm hand. It can not do either, without reducing the workers of this country to serfs. If the Government tries to use the Federal troops to accomplish either purpose, in any state, it must ride over the powers of that state—wipe out all state lines and destroy the sovereignty of all states. With those militant difficulties standing between the passage of a congressional resolution and the actual carrying of it into effect, it is childish to assume that any such thing will ever happen in this country. It becomes, therefore, a waste of time to discuss the still larger question whether the Government should own or operate all of the coal mines. No time will, here, be wasted upon that issue.

It is enough to conclude this article as it began—with the statement that we have spent 10 years discussing and wrangling over something which can never happen. We have been fighting a sham battle over utter impossibilities. We could not do a single thing that has been proposed without destroying the Government itself and without ending the career of a republic on this hemisphere. No such revolution is justified when the objective is merely to reduce by a few cents per ton the selling price of coal for a few months.

LABOR IN METAL MINING

(Continued from page 851)

an educator, as well as an executive and an engineer. That this is possible, however, is being demonstrated in many parts of the country where real results are being obtained in creating a better understanding between all parts of the personnel of successful industries.

THE MINING INDUSTRY AS 1926 CLOSES

Gold And Silver Precarious—Anthracite And Bituminous Coal In The Midst Of Labor Adjustments—Iron, Copper, Zinc And Lead Looking Up—Non-Metallics Prosperous—Petroleum Stocks Drawn Upon To Meet Increase In Demand Over Production

ALTHOUGH it is too early to quote annual production figures, the year's trend may be clearly seen. The general era of prosperity has called for ever increasing quantities of raw materials, thus establishing a new peace-time record in production and domestic marketing. With the exception of the gold and silver industries, mining may be said to be prosperous.

GOLD

The immediate future of gold and silver remains obscure. Gold production is necessarily controlled by price levels. The commodity level of 1914 justified full production. The fluctuations since that time have been disastrous, and today fully 80 percent of the purely good producing mines then in operation, have shut down. As the gold standard is adopted in other countries not heretofore using it, and increased demand for gold will necessarily be created, and while the outlook for the immediate future is not promising for the gold producer, there can be no doubt that in the long run gold will come into its own.

The gold movement so far this year leaves an import balance of \$72,000,000 or about 60 percent of that for the corresponding period a year ago.

SILVER

For silver the future depends upon the situation in the Far East, which has always been the world's market, not only for currency, but for ornaments and as hoarded wealth. If instead of buying 107,000,000 ounces of silver per year, India should put 70,000,000 ounces on the market, the outlook would not be reassuring. Increase in the use of silver in the photographic arts and the development of a larger use of domestic silverware in America, will tend in a small way to assist in maintaining market levels.

ANTHRACITE

The year's record in anthracite coal begins with the second week in February when the strike came to an end. The resulting contract is open to two interpretations. The operators claim that it provides for a reciprocal program of efficiency and cooperation, which will be the basis of arbitration for any disputed points hereafter. The miners say they have not agreed to arbitrate, and the issue will not be decided until January 1, 1927, when the miners may ask for an increase, and the operators for a de-

By DR. HENRY MACE PAYNE *

crease, and the machinery provided for in the agreement thus tested out.

If the operators had received cooperation and efficiency, and a definite program resulting in decreased labor costs, this would have precluded a request for a reduction in scale. But the miners say there will be no cooperation without the check-off, hence no constructive program embodying cooperation and efficiency, and matters are therefore at a deadlock. It is presumed that on January 1 some operators will ask for a reduction in the wage scale and thus test out the matter. In the meantime production has gone along at the normal rate, the first nine months totaling 61,352,000 tons.

BITUMINOUS

Consumption of bituminous coal averages 9 1-3 million tons a week. In addition we have exports overseas and to Canada, aggregating 600,000 tons per week, or a total of approximately 10,000,000 tons normally disposed of, per week, throughout the year. The present outlook indicates that in 1927 we may ship an additional 10,000,000 tons abroad and 2,000,000 tons more into Canada, or a weekly increase of 250,000 tons.

The non-union mines can produce today in the neighborhood of 400,000,000 tons per year, or between 8,000,000 and 8,500,000 tons per week. In the event of a shut down on April 1, this production will be matched against a 10,250,000 ton demand, with from 55,000,000 to 60,000,000 tons in storage. Production for the first 10 months of this year was 460,842,000 tons. The week ending November 20 marked the high peak of American production, at 14,253,000 tons.

The effect of the English strike has been to raise ocean freight rates from \$2.50 to \$9.50. This appears to be a foolish policy, since the \$7 margin involved would have put American coal into many new ports, and would have enabled us to bunker many vessels now using foreign coal.

It is probable that low-sulphur gas coals, and the low-volatile steam coals will continue in demand for export for a considerable time, regardless of the English situation.

The Western coal fields are practically all now working on a cooperative basis of modified unionism. The Alabama producers have a good selling organization,

and are marketing and distributing their product intelligently. In Kentucky and Tennessee, after widely varying fluctuations, the demand for overseas coal, coupled with a strong demand in the mid-west, has enabled the operators to pay 5 percent over the Jacksonville scale. In eastern Kentucky there is a shortage of labor under this new condition, many of the miners having gone into other industries.

The state licensing law of Illinois has served to prevent any but union mines from operating. In this state as well as in Indiana, the mines have for the most part been idle. Active efforts at mechanization by the introduction of coal loading machinery have been made, and if a satisfactory wage scale to cover these conditions, could be adopted, these great coal producing states would materially augment production.

Ohio has been in the throes of a struggle between union and non-union and several cooperatives were formed. This latter movement gained a greater foothold in Ohio than in any other state. A new association was organized, and the Hocking Valley district attempted to resume operations, and compete with the other fields. Just as this movement was going into effect, the demand for export coal began, and operations were at once resumed, on the Jacksonville scale.

Pennsylvania has been torn to pieces and rebuilt. Western Pennsylvania, once strongly union, is now largely non-union. The open shop mines of the Connellsville district have extended into central Pennsylvania. Most of the other union mines either shut down, or after a considerable period of idleness, reopened on a cooperative basis, under the 1917 scale, subsequently advancing wages above the Jacksonville rate, to meet the demand for export production, with the understanding that should the market fall off, the wage would again be reduced.

West Virginia, once competing with Illinois for second place, is now neck and neck with Pennsylvania in production. By virtue of its wide diversity of coals, its felicitous location for both lake and coastwise shipments and its efficient development, this situation is significant, over 1,200 mines being in active operation.

The freight rate situation in coal remains unsettled. Practically every freight rate structure has been attacked, and the whole matter remains in the hands of the Interstate Commerce Commission.

* Consulting Engineer, American Mining Congress.

IRON

The movement of Lake Superior iron ore has approximated the record of 1916. For the sixth time including that year, Lake shipments will exceed 60,000,000 tons. Of this amount, 10,750,000 tons were brought down in August. The general era of construction has been reflected in less price fluctuation than usual. Inasmuch as the movement of iron ore must precede its fabrication by at least six months, and the demand for steel continues, we may expect a sharp movement of ore when spring shipments commence.

Iron and steel prices averaged from \$37.61 to \$38.17 per ton during the first nine months of the year. The output of steel ingots reached a new record level, and earnings were better than in 1925.

Announcement of a renewed attempt to secure the contract business of American ferromanganese producers has caused but little interest. Offers of ferromanganese for six months after January 1 at \$100 duty paid, f. o. b. tidewater have recently been announced. Small lots of English ferroalloys have been sold at this rate, but with her own internal problems, it is not likely that English production will be a feature.

COPPER

It is stated by the Copper and Brass Research Association, that the world has produced more copper in the past 20 years than in the entire preceding period since copper's discovery, about 5000 B. C.

Approximately one-third of the entire production goes into brass and bronze alloys. Two hundred and fifty million pounds will be used in automobile construction this year, while 20,000,000 pounds are used annually in the manufacture of radio equipment.

For 25 years American producers have been handicapped by efforts abroad to depress the price of copper. Employment has accordingly been intermittent, and profits uncertain. To stabilize the price and make steady operation possible and profitable "Copper Exporters, Inc.," was recently organized under the provisions of the Webb-Pomerene Act, with Mr. Cornelius F. Kelley of the Anaconda Copper Mining Co. as president. The 18 principal companies of the United States, functioning through a New York committee, now regulate trade practices and prices abroad. Cooperating with them, is a Brussels committee, representing 15 foreign concerns, acting similarly for world trade.

Next year should therefore see the copper industry following the "even tenor of its way." At the time of writing, the market was around 14 cents a pound and the year's production was estimated at 1,750,000,000 pounds.

ZINC

Production and consumption of zinc

are greater in the United States than in any other country. While the metal is mined and concentrated in many states, the Tri-State District alone supplied \$45,000,000 worth of concentrates last year, and in the first six months of the present year 60 percent of the slab zinc in the country came from this district.

The British strike has seriously affected American exportation, due to the diversion of Australian ores to Continental Europe. Between one-fourth and one-third of the total American slab zinc production goes into the manufacture of over 800 different alloys. Increase in the use of storage batteries has tended to promote the zinc industry, as it has been estimated that over 200,000,000 dry battery containers are used annually.

Research work done in Utah toward zinc extraction from refractory ores by selective flotation now adds \$6,000,000 annually to the state's mineral recovery, and as has been aptly said "makes dividends grow where deficits grew before."

Continued efforts to find new uses, constant advertising by the seller, and a general program of construction, give the zinc producers hope of a continued year of prosperity.

LEAD

World production and prices continued high, stimulated by the extension of long-distance land-cable lines, and the ever increasing demand for storage batteries. The importance of lead is once more emphasized to the producer, by the silver situation, in which as the price of silver decreases, its by-product lead, becomes the major metal, and silver the by-product. The same is true of gold-lead and other complex ores in which the market now offers anomalous changes.

While the known lead resources of the world have not been substantially augmented by new discoveries, improved metallurgical practice is yielding a higher return to the miner. As hydro-electric power becomes available, outlying districts will add to the present sources of supply.

NON-METALLICS

The bauxite industry has grown both in quantity and value per unit of production. Beginning in Georgia, and extending to Alabama and Tennessee, it next embraced Arkansas, which state now has a substantial production, while extensive deposits have also been found in Mississippi. The development of a quick setting cement from bauxitic ores is now an established industry.

The clays of the south, which come into directed competition with imported clays, have steadily advanced in favor and the market continues steady. Refractories are receiving attention in the ceramic schools, and standards of preparation in the various non-metallics, including paint pigments, are slowly being evolved.

New deposits of paint pigments approaching the quality of the best imported ochres and mineral reds have been developed in Mississippi. The prosperity of most of the non-metallics is closely interwoven with tariffs and freight rate structures.

After a seven years shut-down, the operators in Clay and Coosa Counties, Ala., are again producing graphite. The present tariff rate on foreign graphite was insufficient to preclude importations of war accumulation stocks, which, now depleted, enable domestic production to function.

Another factor in the situation is the availability of hydro-electric power furnished by newly constructed lines of the Alabama Power Co.

When the need was paramount Alabama furnished, in 1918, over 7,750,000 pounds of graphite, or over 60 percent of American production. The reopening of these properties marks a distinct advance in non-metallic operation in the South.

PETROLEUM

The petroleum industry today revolves around gasoline production and methods of refining. From a long period of overproduction, the industry has passed during the present year, to a position where drafts have been made upon reserves. About 500,000,000 barrels are still in storage.

Taxation has been a serious question to the producers, who in some states must pay not only ad valorem taxes, but special severance tax and gasoline tax as well.

Transportation rates are favorable to oil distribution, and a new refinery can easily upset an established market. Government requirements that Indian land shall be divided into small units for drilling, lead to inevitable competition and wasteful duplication.

With regard to future resources of petroleum, President W. S. Farish, of the American Petroleum Institute, states that in his opinion there will be no shortage of motor fuel or lubricants for generations to come. He bases this statement on the known reserves of petroleum, to which oil shale will join in the issue whenever the supply of the former begins to dwindle.

CONCLUSION

The great problems before the industry in 1927 are taxation, the Government land situation in the West, increased mechanization of mines, standardization of equipment, the silver situation, the development of oil shale, and in coal mining particularly, industrial relations.

Momentous as they are, these problems are not incapable of solution. With concerted effort by the leaders of the industry 1927 will see a distinct advance and permanent progress.

MINING CONGRESS WORK IN TAXATION REVIEWED

Efforts Begun Prior To 1913 Have Been Attended With Success—But New Problems Confront Mining Taxpayers—Notably A Possible Change In The Basis For Depletion From A Unit Rate Based On Valuation To A Percentage Of Gross Or Net Income

THE taxation work of the American Mining Congress was begun prior to 1913 and has been continued through the intervening years to the present time with a record of successful achievement. Federal tax problems during the last decade have been tremendous. Hundreds of millions of dollars in taxes have been involved in the solution of these problems. All branches of the mining industry have benefitted from the work of the organization.

During the period of 1913 to 1918 recognition was secured in the Federal income tax law of the wasting character of the mineral industries. The enactment of the depletion section in the 1916 law, as a substitute for the 5 percent depletion allowance under the 1913 law, granting to mines, oil and gas wells, timber, and other natural deposits "a reasonable allowance for depletion," was accomplished as the result of a campaign in which the American Mining Congress was the pioneer sponsor. This campaign resulted in the cooperation of the various associations representing particular branches of the natural resources industries, and the successful culmination of the campaign may be attributed largely to this cooperation.

Following the enactment of the depletion section the organization worked to secure the promulgation of proper administrative rules and regulations, and the creation of a natural resources unit in the Bureau of Internal Revenue. In the 1918 law the enactment of the discovery clause, granting an allowance for depletion based on the value of mineral discoveries made after March 1, 1913, was secured. The discovery provision was sponsored primarily by the American Mining Congress.

The taxation work of the organization since 1918 has been devoted largely to efforts to secure the simplification and improvement of the income tax regulations and procedure. In 1920 the first national mine taxation conference was held at Denver in conjunction with the twenty-third annual convention. Following that conference a bill was drafted by the tax committee for the creation of a Federal war tax settlement board to facilitate settlement of war-time taxes. Although this bill was not passed by Congress, the movement was followed first, by the creation of the Committee on Appeals and Review in the Bureau of In-

By MCKINLEY W. KRIEGH *

ternal Revenue, second, by the creation of the tax simplification board by the 1921 tax law to study the administrative situation with respect to adjustment of back taxes, and finally, by the creation of the Board of Tax Appeals under the revenue act of 1924. The Board of Tax Appeals idea grew out of the proposal for the war-tax settlement board, and secured unanimous support from taxpayers and representatives of all the great national business and industrial organizations.

The Tax Division of the American Mining Congress was created in 1920 to coordinate more effectively the efforts of the tax committee and the efforts, with respect to taxation matters, of representatives of the several branches of the mining industry, and to keep in intimate touch with the administration of the income tax law as well as new legislation.

The Tax Division, since 1920, has sponsored many changes in the administrative regulations and procedure as well as amendments to the law. Among the administrative changes recommended and adopted are the following: A new form for individual income tax returns; consolidation of certain audit sections to eliminate duplication of audits; abolishment of the Review Division of the Income Tax Unit; field hearings, wherever practicable, in the taxpayers' home district to avoid expensive trips to Washington on questions which could well be adjusted by the revenue agents in the field.

Amendments to the law which were formulated by the tax committee and sponsored by the Tax Division include the amendment to Section 201(b), revenue act of 1924, requiring that distribution from depletion reserves based on the discovery value of mines shall be treated for taxation purposes as capital distributions to the extent of the basis of the stock and not as ordinary dividends; the clarification of the discovery clause by the provision that "discoveries shall include minerals in commercial quantities contained within a vein or deposit discovered in an existing mine or mining tract by the taxpayer after February 28, 1913, if the vein or deposit thus discovered was not merely the uninterrupted extension of a continuing commercial vein or deposit already known to exist, and if the discovered minerals are of sufficient

value and quantity that they could be separately mined and marketed at a profit." Other amendments of lesser importance sponsored by the Tax Division and the General Tax Committee were enacted by Congress in the 1921, 1924 and 1926 revenue acts.

The Tax Division under resolutions of annual conventions of the American Mining Congress worked for the repeal of the excess profits tax, the capital stock tax, and the stamp tax on original issues of stock certificates. A number of circumstances combined to prevent the repeal or revision of the stamp tax, but the campaign has not been abandoned. In addition to working for the repeal or modification of the stamp tax, the Tax Division is working for the reduction of the corporation income tax rate in cooperation with other national organizations.

In 1921 a special tax committee was formed to investigate mine taxation in the several states. This committee secured exhaustive reports on the tax situation in the principal mining states which showed that the mining industry is being discriminated against in the assessment of state and local taxes. It was finally decided, however, after submitting the question of what action the American Mining Congress should take with respect to state and local problems to representative leaders throughout the mining industry, that state and local questions should be left to the state mining associations. The lack of uniformity between the various systems and methods of state and local taxation made it impracticable to formulate a national program which could be made useful or effective.

Federal tax rates will remain somewhere near their present level for many years. Further relief to the mining industry can only come through a reduction of the corporation income tax and the improvement of the administrative system. Corporate tax reduction of at least 1 percent is now probable, with the possibility that the Government's fiscal situation will soon permit a reduction to 10 percent. But corporate relief of any nature will be secured only if the demand for such relief is general, and so insistent that Congress will have to yield to it.

The American Mining Congress was instructed to seek corporate tax relief by a resolution of its twenty-seventh annual convention held at Sacramento in 1924. The outlook is favorable for early action, and the campaign is being conducted with

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"'Twas the night before Christmas"

© Ernest L. Crandall

every indication that it will be a success.

The revision of the revenue administrative system will not be taken up by Congress until the Congressional Joint Committee on Internal Revenue Taxation, now investigating and studying the system, makes its report to the Congress in December, 1927. At no time since the war has such serious consideration been given to the administrative provisions of the law and the regulations and methods of procedure thereunder as is being given them at the present time. It is therefore essential that the mining industry shall watch developments and be prepared to safeguard its interests.

The question of revenue legislation was of paramount importance in 1917 and 1918, and called for the cooperation of all branches of the mining industry. Although the tax rates are low in comparison with the war taxes, the present situation, which possibly involves a general revision of the administrative provisions of the revenue law, justifies cooperation of a nature similar to that which accomplished results when the war-tax bills were being formulated and debated. Therefore, mining taxpayers should keep in touch with developments and should be prepared to assist in every way possible the agencies upon whom they depend to protect and promote their interests.

The addresses and discussions at the tax sessions of the American Mining Congress Annual Convention at Washington, December 7-10, will provide a background for the efforts and activities of the organization during 1927. Because of the tax investigation now in progress, and the prospect for general revision of the administrative provisions of the revenue law in 1928, it would seem imperative that all branches of the mining industry should be represented at this mine taxation conference, where they can participate in the formulation of suggestions and policies for the guidance of the Tax Division and the General Tax Committee.

Part 2 of the report of the Senate Committee on Investigation of the Bureau of Internal Revenue begins by mentioning depletion allowances as an important matter to be considered by Congress. It refers to the failure of published departmental statistics to show the amount of depletion which has been allowed the different mining industries. It points out that a percentage basis for depletion allowances has been suggested for mines, and states that if the statistics were shown, the basis for the determination of a proper percentage of gross or net income would be available. It is understood that the Treasury Department is having or has had these statistics compiled for the information of the congressional joint committee.

The oil industry was given a percentage basis for depletion in the revenue act of 1926. The allowance is 27½ percent of gross income subject to a limitation that the allowance in any case shall not exceed 50 percent of the net income from the property to which the allowance applies, and subject also to the provision that it shall not be less than would be allowable on the basis of cost. Statistics are being compiled for the joint committee to show the effect of this change on the returns and taxes of the oil industry for the taxable year 1925.

Owing to the administrative difficulties that have been encountered in the work of valuing mines, engineers of the income tax unit have given considerable thought and study to the practicability of a percentage basis for depletion. The subject has been discussed at tax conferences of the American Mining Congress, notably at Milwaukee in 1923, by Mr. Paul Armistage, of New York City, chairman of the Mining Congress Tax Committee, and at Sacramento in 1924, by Mr. A. P. Ramstedt, of Wallace, Idaho, formerly a member of the Advisory Tax Board of the Treasury. Recently the subject was referred to by Dr. T. S. Adams, of Yale University, and by Mr. Geo. E. Holmes, of New York City, at the 1926 meeting of the National Tax Association in Philadelphia. It is, therefore, a live question and undoubtedly will be considered by the joint committee in formulating its program for the improvement and simplification of the income tax system. The percentage basis most generally mentioned is that based on gross income; but no definite plan, except in the case of oil, has been passed upon by the Treasury Department or by the committees of Congress.

It is generally believed that the depletion allowances of the coal industry have been too low under the war-tax acts and subsequent revenue laws. Coal valuations based on 1913 royalties and other conditions existing at March 1, 1913, in the coal industry, in many instances were so low as to give a unit rate per ton of less than 2 cents, and in some cases of less than 1 cent. A percentage basis would in all probability bring the depletion allowances of coal mines up to a fair and reasonable level.

Whether or not a percentage basis can be evolved that would give a reasonable allowance to metal mines, is debatable. The simplicity and certainty of such a basis can not be questioned, but the difficulty in the case of metal mines will be encountered in the determination of fair percentages for different kinds of metals and types of mines.

The evolution of the income tax system must be followed closely. The congressional joint committee will look to the mining industry for help and cooperation

in dealing with the problem of depletion. The Tax Division of the American Mining Congress has placed its facilities for gathering statistical and other data at the disposal of the joint committee. The Tax division also is cooperating with the representatives of other national organizations on a Joint Committee on Tax Cooperation. In this manner the Tax Division will continue to function in the interest of the mining industry, guided by the advice of the American Mining Congress Tax Committee and the policies announced by the mining industry through resolutions of the Mining Congress annual conventions.

PRODUCTION OF SULPHUR IN 1925

THE production of sulphur in 1925 amounted to 1,409,240 long tons compared with 1,220,561 tons in 1924, and has been exceeded only by the production of 1921, 1922, and 1923, according to the Bureau of Mines. Shipments from mines in 1925 totalled 1,857,970 long tons compared with 1,537,345 tons in 1924, and were greater by 239,129 tons than the shipments in 1923, the previous year of greatest movement. As in 1924 shipments were considerably in excess of production. Stocks in the hands of producers were thus reduced from 2,700,000 long tons at the beginning of the year to 2,250,000 tons at the end of the year, the lowest level since the end of 1921, and 750,000 tons lower than those on hand at the end of 1923. The estimated value of the shipments in 1925 is \$29,000,000.

For a number of years prior to 1925, over 99 percent of the sulphur production of the country came from the mines of Louisiana and Texas, but abandonment of operations at the original big sulphur mine in Louisiana in 1924 left only the Texas mines as large producers and in 1925 over 99 percent of the production came from them. Shipments of Louisiana sulphur are still being made from stocks, and small shipments were made in 1925 from Nevada and Utah mines.

Exports of sulphur or brimstone in 1925 were the largest ever recorded, being 629,401 long tons, compared with 482,114 tons in 1924, and were 30 percent higher than those of 1922, the previous year of highest record. Of the exports in 1925 Germany received 136,972 tons; Canada, 125,681 tons; France, 110,684 tons; and Australia, 71,530 tons. Exports of refined, sublimed, and flowers of sulphur totalled 6,381,791 pounds, of which Canada and Mexico received the major portion. As usual the imports of sulphur were negligible.



*Massive Oil Shale,
Wyoming Oil
Products Co.,
Green River,
Wyoming*

PRESENT ACTIVITIES IN THE OIL SHALE INDUSTRY

It Is Estimated That More Than \$50,000,000 Are Lost Annually In Wildcat Drilling—This Sum Would Erect And Put In Operation Forty Oil Shale Properties Producing Sixty Thousand Barrels Of Shale Oil Daily—Shale The Bulwark Against Oil Shortage

THE users of crude oil or any of its products—gasoline, lubricating oil, wax, or fuel—need have no fear that their supply will be ruthlessly cut off even though the Oil Commission, appointed by President Coolidge, estimates that only four and a half billion barrels of oil remain in the ground, or at the present rate of consumption, a supply for only six years. The known oil shale fields will furnish an adequate supply of oil even at a greatly increased rate of consumption for a great many years. The supply of oil should be clearly divided into two separate sources. First, the well oil, manufactured by nature, and found in pools by drilling, after a preliminary geological survey to determine the probability of locating an anticlinal structure favorable for oil concentration. The second source is oil shale or possibly coal. In the case of oil shale the ingredients of oil—carbon and hydrogen—are in the shale in the form of animal and vegetable remains. That is, only the raw material is in the shale. Nature has supplied merely the ingredi-

By VICTOR C. ALDERSON*

ents; the work of distillation must be done in order to secure the oil. Thus the shale oil industry is strictly a manufacturing project—the completion of the work of nature. Well oil production, on the other hand, is strictly mercurial in its character. The production is up and down—a prince or pauper condition—sudden acquiring of riches or sudden exhaustion of funds. The statistics of well oil production can be made to prove any thing the manipulator desires. The calm dispassionate figures of the Oil Commission of four and a half billion barrels of reserve oil, only a six years' supply, should give one cause for serious reflection.

AN OLD SHALE FIELD

An oil pool is an underground tank farm, formed by nature but discovered by man. Where nature has placed these farms and what they contain is unknown. The hope of finding them gives enthusiasm and hope to the oil prospector. The successes are widely heralded; the failures are not advertised. The U. S.

Bureau of Mines states in a recent report, that from 1859 to 1924 of all the wells drilled for oil or gas 20 percent were failures. In 1924, of all the wells drilled, 10 percent proved to be gas wells, 67 percent oil wells, and 23 percent dry holes. Thus in 1924 only two out of three proved to be oil wells and in many of these the production was only a few hundred barrels a day.

A recent resolution from the National Petroleum Marketers Association states the situation clearly:

"To continue the present national program of permitting the lucky discoverer of a new crude oil pool to flood the market and demoralize and destroy legitimately invested capital in the refining and distributing branch of the industry, by forcing outlet for crude oil products unnecessarily, is economically unsound."

It is estimated that \$50,000,000 are annually lost in wildcat drilling. This sum would erect and put into complete operation 40 successful oil shale properties that would manufacture 60,000 barrels of shale oil a day, at a cost of approximately \$1.25 a barrel. Unlike

* Denver, Colo.

an average successful oil pool which quickly passes through a flush period to one of pumping and then of exhaustion, an oil shale field can be made a source of steady regulated production extending over a long period of years. The ground can be diamond drilled, the thickness of each stratum measured, and its oil yield determined. The production can be regulated according to the demand, unlike well oil the production of which is dependent upon the chance discovery of new pools, a feature beyond the control of oil operators. Since the production of oil from shale is a manufacturing project the output can be regulated to meet the market—increased when the market is strong, curtailed when the market is weak. It is interesting to note that experiments at Columbia University by Dr. P. V. D. Manning, under the direction of Prof. Ralph H. McKee, tend to show, from a geological point of view, that petroleum has been formed in past ages from oil shale. Consequently oil shale is the mother of petroleum.

GASOLINE FROM SHALE OIL

The early retorting of oil shale gave an oil with a large percentage of cracked hydrocarbon compounds. In the ordinary refining, practiced at that time, such compounds were eliminated and became a severe loss. The ordinary refinery man jumped to the conclusion that the refining of oil shale could be done only at such a loss as to make the process non-commercial. In some cases he said that shale oil could not be refined at all. He should have said that he did not know how to do it. In point of fact he did not know, as succeeding experimental work has amply proved. The products from oil—gasoline, lubricating oil, fuel oil, wax and ammonium sulphate—are individually important but the demand for gasoline transcends all

other demands so that the kind of gasoline obtained from shale oil is of the utmost importance.

Jacque C. Morrell and Gustav Egloff, in the Research Laboratories of the Universal Oil Products Company, Chicago, after extensive laboratory work on the subject, presented a paper on "Anti-knock Motor Fuels by Cracking Shale Oils," before the American Chemical Society at Tulsa, Okla. Their summary is as follows:

"Shale oils of American, Australian, and French origin have been cracked into yields of gasoline in excess of 50 percent, based upon the charging oil" (The American oil was distilled in the Lamb retort of Denver from Colorado Oil Shale).

"Chemical analysis of the cracked gasoline indicated it to have high anti-knock properties as a motor fuel. Methods of treating a cracked distillate, obtained from the cracking of shale oil, produced a water-white, sweet-odored, and stable product.

"Oil shale as a potential source of motor fuel in the United States is sufficient to fulfill the requirements for over 150 years based on present requirements of consumption."

They also say:

"Shale oil as a future substitute for petroleum is now generally recognized." Also, "It is well recognized that the future of the oil shale industry will depend to a large extent upon the profitable conversion of the crude shale oil into motor fuel. * * * Without doubt the cracking of shale oil to produce anti-knock motor fuels will be the dominating factor in its commercial exploitation."

Dr. Roy Cross, of Kansas City, inventor of the Cross process, states in a private letter:

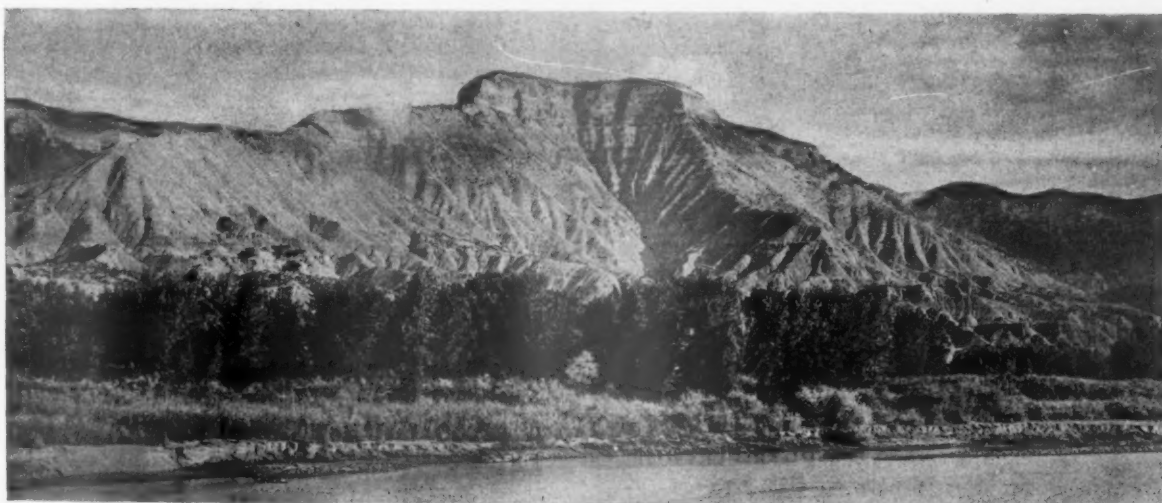
"We are getting more samples and

inquiries concerning the cracking of shale oil than ever before, particularly from foreign countries. This indicates that the subject is more a live issue than ever. One interesting feature of the newer investigations is the fact that gasoline made from shale oil is quite superior to gasoline made by the normal distillation of petroleum. * * * We find in our engine testing laboratory that the average shale oil gasoline will give 20 to 25 percent more power than the usual petroleum gasoline. This is due to the fact that much higher compression can be used and that the gasoline has anti-knock qualities." This, of course, refers to the gasoline produced by cracking the shale oil at very high temperatures and pressures in accordance with the Cross process.

There can, therefore, be little or no doubt that gasoline obtained from shale oil will, because of its anti-knock quality, have a marked superiority over gasoline from well oil.

COSTS

The all important query by the investor is: What will it cost to manufacture a barrel of shale oil, refine it, and place the products on the market in competition with similar products from well petroleum? Also, is there a sufficient margin between cost and selling price to justify capital in erecting oil shale plants? A careful distinction should be made between the cost of mining a vein of oil shale like the "Mahogany" of Colorado and Wyoming and removing a whole hillside by steam shovel. Clearly the vein must give a large yield of oil to cover the higher cost of production. For open cut mining alone the records of the porphyry copper properties are instructive, as methods similar to these will be in use in the mining of oil shale by open cut methods. At the Utah Copper Co. the cost of min-



Naval Oil Shale Reserve, Rulison, Colo.



Oil Shale Plant of the Catlin Shale Products Co., Elko, Nev.

ing and stripping, from 1910 to 1924, varied from \$0.2441 a ton to \$0.537 a ton or an average of 40 cents for 15 years. At the Nevada Consolidated, for the years 1914 to 1915, the cost of stripping was \$0.3019 and mining alone \$0.1803 a ton. For the years 1920 to 1923 the cost per ton, exclusive of depreciation and taxes, was \$0.2679. At the Chino Copper Company for the years 1912 to 1916 the average cost of stripping was \$0.2075 and of mining \$0.1652. From these figures, which are from actual operations similar to those to be used in open cut oil shale mining, the cost of mining and placing oil shale in the retorts should not exceed 40 cents a ton. R. V. Barkalow, president of the Uintah Company of Utah, has made a very careful analysis of costs and finds that, on their Utah property by open cut mining, oil can be produced for \$1.16 a barrel. Two careful tests have been made at Casmalia, Calif., one by G. W. Wallace and one by Smith, Emery and Co. One test showed a cost of \$1.37 a barrel; the other \$1.18 a barrel. A fair mean is that \$1.25 will cover the cost of producing a barrel of crude oil, by open cut methods in a plant of commercial size, that is 500 barrels a day. L. Daams, a technical oil expert of wide experience, has made a careful survey of the cost of operating a 300-ton Trumble plant on the property of the Wyoming Oil Products Co. at Green River, Wyo., and estimates the daily cost of operation, including administration and overhead, to be \$538.60 on shale yielding a barrel of oil to the ton. The present market value of the gasoline, wax, and lubricating oil produced would be \$2,376.35.

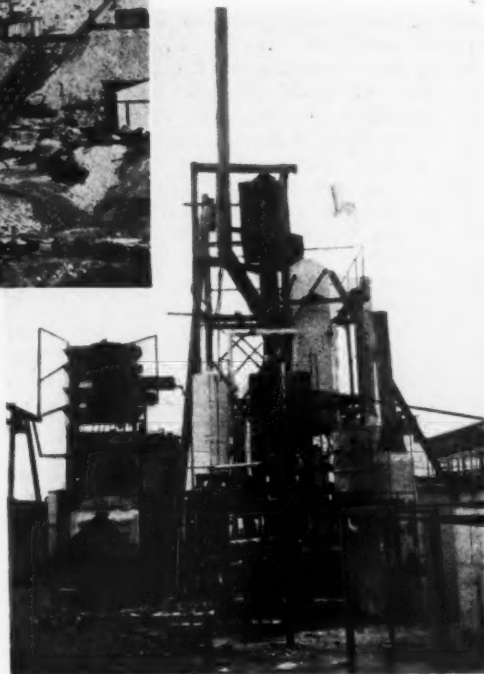
METHODS OF MINING OIL SHALE

In the earlier studies of oil shale deposits the first ones to be examined and tested were horizontal strata, outcropping on the hillside. To mine such deposits coal mining methods would certainly have to be employed, explosives

used, a fine dust formed and, as in coal mining, possible explosions. Such mining is known, from more extensive study, to be limited to the development of such high grade oil shale as the "Mahogany" of Colorado and Wyoming and the Catlin deposit in Nevada. Another type of oil shale deposit, however, has been found within the last few years; that is, the mass formation, like that at Casmalia, Calif., the Uintah Basin, Utah, at Green River, Wyo., and in Kentucky, where open cut methods can be employed. There are no problems of dust explosion, ventilation, haulage, falling of roof, or any of the other underground hazards. The cost of mining, too, is much less. Thus there are, on one hand, the rich strata like the "Mahogany," in which the yield of oil is around 60 or 70 gallons to the ton, but with a comparatively high cost of mining; on the other hand are the mass deposits with a yield of about 30 gallons per ton but with a low cost of operation and none of the hazards of underground operation. With the very extensive mass deposits now known to exist in the United States it is likely that most of the oil shale projects in the near future will develop the large low grade properties first. There are enough of these to meet the demand for hundreds of years. The most striking features in the oil shale development are that in California, Utah, Wyoming and Kentucky, there are almost limitless fields of oil shale that yield to open cut, steam shovel methods of mining and that crude shale oil can be produced in quantity, of high quality, and at such a low cost as to make it a valuable adjunct to well oil production.

RETORTS

Trumble Retort.—The Trumble retort is of the vertical circular type, 3 feet 6 inches in diameter and 16 feet high, with a 5-ton capacity, made of wrought iron covered



Trumble Oil Shale Distillation Plant, Alhambra, Calif.

with asbestos, internally heated by superheated steam at 1,200 degrees under 60 pounds pressure. The use of direct heat, and particularly superheated steam, on the shale is an economic advantage over external heat as no heat is lost in passing through the wall of the retort; also, the asbestos covering prevents the loss of heat by radiation. To make the actual process of distillation still more efficient the shale is first put through a pre-heater, where, at a temperature of 300 degrees, the shale is dried and much of the contained water is evaporated. The shale goes into the retorts heated and thus the time of distillation is reduced. A commercial battery should contain 12 retorts in four groups, with three retorts in each group. The time of distillation is about 4½ hours, so that a battery can treat 300 tons a day. The striking features about the Trumble retort, that mark it off from all the others and put it in a class by itself, are:

1. The device for opening and closing both the feed and the discharge end of the retort. This is so simple that the wonder is no one thought of it before. It is operated mechanically and the time consumed in emptying and filling a retort is strikingly brief.

2. The economical use of superheated

steam. It is a well known fact that the use of steam increases the yield and improves the quality of shale oil. The cost of producing superheated steam, however, has been a handicap. Mr. Trumble has overcome this difficulty by sending the steam at 1,200 degrees through the first group of three retorts, reheating it and putting it through the second group, and so on through the four groups. Thus the heat value of the superheated steam is conserved and the cost made reasonable.

3. The continuity of operation makes for economic operation. There is no break between the crude oil when produced and the refining of it. The retorting and refining is one continuous operation, unlike the procedure with well oil where the oil has to be carried through pipe lines long distances to the refinery. The crude oil nowhere is visible but goes directly from the retort to the refinery. Thus the cost of reheating is eliminated. In other words, raw shale goes in at one end; the finished product comes out at the other.

The Lamb Retort.—This retort, invented by W. A. Lamb of Denver, is reported to produce a fine quality and high gravity of oil. A semi-commercial sized retort has been erected in Denver which treats three tons of shale in 24 hours; a full sized commercial retort will treat 200 tons a day. The inventor claims, as advantages of his retort: simplicity of design, and accessibility of moving parts; continuity of operation and agitation of the shale; small horse power required, only 20-horse power for a 200-ton retort; production of 38-degree baumé oil and high anti-knock quality and a dry step condenser gives highly satisfactory results.

The N. T. U. Retort.—This retort is of the vertical, internally heated type and is distinguished from all others by a down draft instead of an up draft. Each unit, or retort, is 11 feet in diameter and 24 feet high lined with fire brick. Each charge contains 40 tons of shale. The time of distillation is 24 hours. When the distillation is complete the bottom grate is drawn out and the entire mass of spent shale drops out.

Corfield Retort.—This retort is unlike any other in that it consists of 24 small 1-ton retorts on a revolving turn-table. One revolution of the table takes two hours, in which time complete distillation occurs. Thus each retort is dumped and refilled as it completes a revolution.

Acme Retort.—This retort is of the horizontal cylindrical type in which the outer cylinder revolves. Within are fixed horizontal tubes through which the heat is passed. By the revolution of the cylinder the shale tumbles about the hot tubes, which are at all times covered with shale and distillation of the shale results. A test of Kentucky shale in this retort made at Mt. Sterling, Ky., yielded 30 gallons of oil to the ton.

COLORADO

Government Plant.—The most outstanding activity in Colorado has been the erection and operation of a Pumpherson (Scotch) retort at Rulison. This plant was purchased in Scotland to the last nut, bolt and brick, imported, and erected. A two-mile tram was constructed to bring the shale to the plant. There has also been erected a N. T. U. plant on adjacent ground. Both are vertical retorts but differ in essential particulars. The N. T. U. plant has a down draft with the vapors taken off at the

bottom; the Scotch has an up draft with the vapors drawn off at the top. The N. T. U. is more efficient for high grade shale; the Scotch for low grade. The N. T. U. is primarily designed for the production of oil. Since the Scotch shale contains enough nitrogen to make ammonium sulphate commercially profitable in Scotland ammonium sulphate is regarded as the primary product and oil as only a by-product. That is, more money is made from ammonium sulphate than from oil. The Scotch plant has, while in operation, produced a tank car of shale oil which has been shipped to the Bureau of Mines experiment stations for further study.

Washington Plant.—The plant of the Washington Shale Oil and Products Co., located 14 miles north of De Beque, at the head of Conn Creek, is rapidly nearing completion. Satisfactory progress has been made in opening the mine which is now producing shale that averages 58 gallons of oil to the ton; even better shale is expected as the main entry is extended. The retort of the improved Ginot type is entirely completed and ready for operation. The electric power plant is complete and has made satisfactory trial runs. Two crushers are in place and have operated successfully. The shale chute, carrying the ground shale from the crushers at the mouth of the mine 2,100 feet below to the shale bin, is also completed. There remains but little to be done before trial runs will be made. The plant will be in operation by the middle of December.

The Index Shale Oil Company.—This company, under the presidency of Harry L. Brown, has its retort—the invention of the president himself—and the entire plant now ready for commercial operation. The retort is of the horizontal, circular type, in which the shale is advanced by means of flanges, on the periphery of the retort so angled as to produce a forward motion of the shale. A ten million cubic foot gasoline absorption plant has been added which will absorb, from each thousand cubic feet of gas, a minimum of a gallon of gasoline. The shale will be mined on the open cut plan at small cost. A new use of the spent shale has been found by Mr. Brown; that is, its use in the manufacture of black paint.

KENTUCKY

The oil shale field of Kentucky possesses unusual interest not only because it surrounds the famous blue grass region but because of its geological history. In a far distant geological age southern Ohio, Indiana, Illinois, and Kentucky were the bed of a vast ocean, now called the Devonian sea. In the bottom of this sea was laid down, by the erosion of the adjacent land, a vast amount of clay or shale, now known as



Oil Shale Deposits, 150 Feet High, The Uintah Co., Uintah Basin, Utah

the Black Shale. To this deposit fish and other forms of sea life contributed their remains in large quantities. At this stage of the earth's history land life was inconsiderable, but sea life was abundant. Consequently this particular deposit has a character all its own, as a result of containing an excess of the remains of sea life over land life. In succeeding ages layers of sandstone, limestone, and other sedimentary deposits were also laid down. Finally, there came, through the general contraction of the earth's crust—like the wrinkles that come in a baked apple when it is allowed to cool—a gradual elevation of these horizontal deposits into the Cincinnati uplift, that is to the form of a flattened letter A. In succeeding ages the apex of this uplift was eroded and only the sides were left sticking out. This erosion has gone so deep as to remove every stratum, in the middle of the anticline, down through the deposit first mentioned—that is the Devonian—and has left the Devonian jutting out all around the outer border of the anticline. The blue grass region of Kentucky covers an irregular horseshoe area of 50 miles in radius with Lexington as its center. The blue grass section is surrounded by bluffs and escarpments of Devonian shale, and other sedimentary rocks, to a total length of 250 miles. This fringe is cut into by ravines and gullies till the entire frontage is irregular to the last degree. These bluffs form the oil shale deposits. Thus the blue grass region of Kentucky is in the bottom of a great bowl, the bottom of a great anticline with its apex eroded, fringed by bluffs of oil shale, of Devonian age. In places the outcrop of shale reaches a height of 200 feet but a conservative average for the 250 miles of exposure is 50 feet. The dip is slight so that the deposit is easily worked for an average of three miles back from the outcrop. Prof. C. S. Crouse, of the University of Kentucky, who has travelled over the entire district and has made a careful, conservative survey, estimates that there are 1,000 square miles of this shale exposed and available for commercial exploitation by open cut and steam shovel methods. On the basis of an area of 1,000 square miles, 50-foot thickness, and 130 pounds to the cubic foot, there are available, therefore, 90,604,800,000 tons of shale. This is a stupendous figure, but the oil shale deposit itself is stupendous. Not only is this great deposit easily accessible, but the greater part of Kentucky, except the blue grass region, is underlaid by an extension of



Massive Kentucky Oil Shale

this deposit, all of which forms a deposit beyond accurate computation. It may be difficult for the average human mind to appreciate the meaning of these figures, but in time we shall become accustomed to thinking in lots of a billion barrels of oil as we have become accustomed to a billion dollar Congress. The Kentucky oil shale field is similar to the Green River deposit in Wyoming; that is, a mass deposit of oil shale; cheap open cut mining; nearness to markets and an inexhaustible supply of water. Such oil shale fields are destined, in the near future, to be profitable oil shale projects.

CALIFORNIA.

Trumble Process.—B. L. Thane and associates of San Francisco have acquired the world rights to use the Trumble Process, except for Sweetwater County, Wyo., and are now preparing plans for a full sized commercial plant. A pilot plant is now being erected at Oakland, Calif., under the supervision of L. Daams. It consists of four batteries of two retorts each with a daily throughput of nine tons of shale. The same principle is used as in the larger plants; that is, superheated steam under pressure, reheated after passing through each two retorts. After a few test runs in Oakland the plant will be dismantled and taken to Japan by the Japanese representative, R. Takata. A larger and more complete demonstration unit is also being erected on the Union Construction Company's property between the Key Route and Southern Pacific piers. This plant will be used in making tests and preparing data for new commercial Trumble plants.

The N. T. U. Plant.—Since Jan. 1, 1926, four units each of 40 tons daily throughput have been installed and the plant is now in continuous commercial operation under the control of the As-

sociated Oil Company, of California. A pipe line from the plant to the Southern Pacific Railroad at Casmalia, five miles in length, carries the crude oil to railroad transportation. The crude shale oil has a good market for mineral flotation and is shipped not only to mining companies in this country but also to Bolivia and Mexico. The testing of shale has been international in extent. Tests have been made on oil shale from Spain, France, Brazil, South Africa, Argentina, Germany, Japan and Italy.

At the University of California an oil shale laboratory is being built for testing purposes. A. J. Carlson is conducting research on kerogen as a source of oil, with particular emphasis on the chemical and physical changes that occur when the kerogen is converted into bitumen.

At Salt Lake City lubricating oil from crude shale oil is being sold commercially for auto use in four grades: A, a light oil especially for cars in good condition during the winter; B, a heavy oil for old cars, tractors, and heavy duty trucks; C, a medium oil used in cars in good condition during the summer, or cars somewhat worn in the winter; D, a medium heavy oil good for summer use in worn cars. The dealers advise customers not to drain their oil until they have used it for at least a thousand miles. The holding of lubrication ability in these oils is unusual as has been shown by actual use extending over periods of time long enough to convince the most skeptical.

NEVADA

The Catlin Plant at Elko, Nev., although of commercial size, has always been regarded by Mr. Catlin as an experimental plant. He has proved that he can produce shale oil and its products satisfactorily. The products—gasoline, lubricating oils, and wax—have been sold on the open market in competition with similar products from well oil.

WYOMING

The oil shale deposits of Wyoming occur chiefly in Sweetwater County, on the banks of the Green River for a distance of 60 miles north from the Colorado line. High bluffs of oil shale occur sometimes on one side only; sometimes on opposite sides. On account of the meandering character of the river and the bluffs adjacent to the water, a wagon road in the bed of the river is not feasible. Consequently the wagon roads are on the mesa and the bed of the river is reached by roads down the canyons. In this, the southwestern part

of the state, there are 460,000 acres of oil shale land. One well, 23 miles by road north of the city of Green River, showed 108 feet of solid shale.

The chief development work in Wyoming has been done by J. Edson Himes, of Chicago, on his large acreage, one and one-half miles north of the city of Green River, in locating and carrying land to patent, as well as in experimental and development work. The Wyoming Oil Products Company owns 320 acres of patented oil shale land on the banks of the Green River one and one-half miles north of the city of Green River. This deposit shows a vertical height of 200 feet of oil shale which, recently tested at the Trumble testing plant at Alhambra, Calif., yielded 26.2 gallons of oil to the ton, on a sample weighing 700 pounds representing the entire 200 vertical feet. Other tests have given yields up to 50 gallons a ton. The property itself is ideally situated for low cost operations. The Green River yields an inexhaustible supply of water, the shale can be open cut mined, there is ample dumping ground, and there is a good road—the Lincoln Highway—to the town of Green River, one and one-half miles away, and to the ample shipping facilities of the Union Pacific Railroad. The company plans to erect a 300-ton plant of the Trumble type. The shale has been tested numerous times in the Trumble retort and the results indicate that this retort is well adapted to treat this type of shale. This deposit, because of nearness to railroad transportation, ample water supply, a mass deposit of oil shale, open cut mining, and very low cost of operation, offers an unsurpassed location for an early and profitable oil shale plant. There is sufficient oil shale on the property of the Wyoming Oil Products to supply a plant of 900 tons daily throughput for 478 years.

CONCLUSION

A dispassionate view of the oil industry as a whole reveals several fundamental factors that are worthy of very serious consideration.

First. This is an age of oil. Without oil and its products our present day civilization could not exist. In the future, the demand for oil will vastly increase especially as fuel oil, as gasoline, and as

a lubricant. This increased demand must be taken care of.

Second. The supply of oil from wells is an uncertain quantity in spite of the alluring statements from the optimists that new oil pools always have been found; ergo, they always will be found. Oil as a natural product is a wasting asset. When once taken from the ground it is used and cannot be replaced. It is now being consumed at a rate so much more rapid than its production by nature that the mind can scarcely make the proper comparison.

Third. To take care of the great demand in the near future some additional source of supply must be found. That is the inexorable logic of the situation. Vegetable sources have been suggested but they can supply but a small quantity and that can not be spared from the food supply. The one, and only one, source of oil that exists in quantity to meet the demands of centuries, that is found in virtually every country in the world, that can be treated in large quantities at a low cost, is oil shale. In the United States we have enough oil shale to last for many centuries, several distillation retorts developed to the stage of economic production at low costs, and a technical personnel capable of solving the problems of mining, retorting, refining, and marketing. Thus the United States holds an enviable position as to the future. The oil problem is the largest on the industrial horizon and, as far as we are concerned, the user of fuel oil, whether for steamship, locomotive, or domestic use, the auto driver requiring gasoline, or the machinist desiring lubricants need have no alarm for the future.

Fourth. In a few states the amount of shale oil easily obtainable has been carefully estimated. For Colorado the



On the Lincoln Highway. Oil Shale Deposit, Green River, Wyo.

amount is 80 billion barrels, for Kentucky 50 billion, for Indiana 20 billion, and for Utah 23 billion barrels. There are also large deposits in California, Montana, Nevada, Oregon, Wyoming, and Ohio, as yet unestimated. It is quite certain that there are 200 billion or more barrels of shale oil producible in the United States from the known oil shale fields. This amount is more than 40 times the amount of well oil reserves, estimated by President Coolidge's Oil Commission and is equal to the present

well oil production for the next 200 years. With this possible future supply every individual, every corporation, every user of oil or its products in any form whatsoever can view the future with the utmost calm and complacency.

TESTING METHODS FOR OIL SHALE

INFORMATION regarding apparatus and methods for the testing of oil shale and shale oil, developed by the Bureau of Mines, is contained in a manual just issued by the Bureau. In order to study the principles that govern the retorting of oil shales and to test the oils produced, it has been necessary to develop and standardize reliable apparatus and methods for distilling shale, and to adapt to the testing of shale oils some of the methods the Bureau of Mines uses for testing petroleum. The results obtained in tests of oil shale and shale oil depend upon the apparatus and methods used, as well as upon the nature of the shale. Many retorts now used in oil-shale assaying are unreliable and give misleading results. Furthermore, no comprehensive method for the examination of oil shale or shale oil has yet been adopted by the shale industry. Consequently, to assure convenience and accuracy in rapid assays in laboratory and in field tests and to provide a basis of comparison between assays made by other methods, a standardized retort and standard methods of testing are necessary.

As a result of these studies much information is now available concerning laboratory methods of producing the greatest yields of the best products.

Copies of Bulletin 249, "Manual of Testing Methods for Oil Shale and Shale Oil," may be obtained from the Bureau of Mines, Washington, D. C.

THE AWAKENING OF THE SOUTH

Report Of The Southern Division—Groundwork Accompanying Its Organization—Field For Development—Apathy In Many States—Results Accomplished Wherever Cooperation Is Given

THE Southern Division of the American Mining Congress was organized at Chattanooga, Tenn., September 29, 1922. During the succeeding three years, a survey of the undeveloped mineral resources of the South was completed, and is still in manuscript awaiting the completion of its underwriting for printing.

This volume, when issued, will meet the demand for a ready-reference, well-indexed work on the 83 minerals found in commercial quantity and quality in the South. It should be of equal value to both producer and consumer, and points the way for intelligent mineral development in the states concerned.

The newly elected Board of Governors met in Cleveland a month later, coincident with the annual meeting of the American Mining Congress, and organized, with William H. Lindsey of Nashville, Tenn., as chairman. Mr. Lindsey continued to serve through the meeting at Birmingham, February 16, 1925, where he was reelected, and until the Memphis meeting, March 15-17, 1926, at which time Mr. C. J. Griffith of Little Rock, Ark., became Chairman of the Board.

The Memphis meeting was an ambitious one which was well attended by executives from many industries, railroads, banks and commercial bodies, and the program, which lasted three days, was replete with helpful addresses, all pointing the way to the upbuilding of new industry.

This Industrial Development Conference bade fair to put the Southern Division on sound financial footing, and at the executive meeting of the newly elected Board of Governors and a Ways and Means Committee a budget was established for each state, and a plan of campaign initiated.

The results to date have been disappointing. In only one state has the budget been reached, although several others are still working to this end. Mississippi through its active State Board of Development and with the cooperation of the Gulf, Mobile and Northern Railroad, has been enabled to utilize the services of the Mining Congress and as a result several new industries have been opened up, and a number of non-metallic mineral deposits located and proved, in that state.

With the denudation of large forest areas, a few of the Southern states have undertaken reforestation. The railroads through their industrial departments have sensed the necessity for new sources of tonnage as forest products wane, and capital is looking to the South as a source of raw materials which shall thus serve to supply a growing market, and to conserve the earning power of the transportation systems.

It is interesting to pause a moment in review, and to note the amazing mineral development which has already been reached in the South. To quote the latest statistics, the South already produces 42 of the 83 minerals found within her borders. One hundred percent of the bauxite and fuller's earth mined in America, 99 percent of the sulphur and phosphate rock, and 92 percent of the barytes, all originate in the South. Natural gas and its products, carbon black and gasoline, petroleum, mica, asbestos, lead, zinc, asphalt, and coal are among the major minerals produced, while the iron ore, limestone and coke of Alabama yield approximately five million tons of pig iron annually. Eighty-six percent of the product of the Birmingham mills reaches ultimate consumption within its native and adjoining states.

Centering around the Schools of Ceramics at Georgia Institute of Technology and at the State College of Engineering in North Carolina is a rapidly growing industry. The clays of Georgia, the Carolinas, and Florida have thus received special study and corresponding development. Those of Kentucky, Tennessee and Mississippi are similarly reaching new markets, and in Mississippi, especially, the American Mining Congress has been of assistance in locating previously unknown deposits of white filler clays, bentonite, paint pigments, sub-bituminous coal and the new refractory baukite.

A word as to baukite is not amiss. This refractory, unknown five years ago, and developed in the Austrian Tyrol, is a non-spalling silica-zircon compound, which fuses at about 3254 degrees F. and forms an impenetrable glaze. It should not be confused with bauxite, a word of similar spelling, the name of

the refractory having originated in the town where it was first mined.

Deposits of this material have been found and proven in Tennessee and Mississippi, and the tests already made indicate that this material will prove a valuable asset.

The great feldspar and fluorspar operations of the South yield better than 40 percent of the country's production. The iron ore deposits along the North Carolina-Tennessee line, and those of northeast Texas and Mississippi will prove within the next generation to be of active value, while with the increasing demand for storage batteries in the radio and automobile industries, the lead and zinc field of the White River valley in Arkansas will become an active producer.

Good roads, schools, and diversified agriculture bring new industries, capital, and local consumption of home products. In textiles the lesson has been learned; in ceramics it is just taking root; in many other products of daily use whose raw materials now come from the South, to be manufactured in remote centers, the finished article returns to demand a thousand percent profit.

That so many opportunities have so long remained ungrasped is a matter of regret. That the progress already made will continue in rapidly increasing proportions is the logical conclusion. Unlike the ploughman in Gray's "Elegy," it can not be said that:

"Knowledge to their eyes her ample page

Rich with the spoils of time, did ne'er unroll;

Chill penury repressed their noble rage,
And froze the genial current of the Soul."

LEGISLATIVE REVIEW

(Continued from page 856)

The War Department, in cooperation with the Shipping Board, has issued a report entitled "Transportation on the Great Lakes," including chapters on the movement of coal, iron ore and petroleum. The report shows in considerable detail the development of commerce and shipping on the lakes. It has numerous graphs and colored charts showing the movements of important commodities. Terminal facilities are described with information as to costs of transportation and terminal charges. Copies are available from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is \$1.50.



METALS

PRACTICAL OPERATING MEN'S DEPARTMENT

GUY N. BJORGE, Editor

*Practical Operating Problems of the
Metal Mining Industry*



MINING OPERATIONS AT CHUQUICAMATA, CHILE, S. A.

Description Of Mining Methods Including Churn Drilling, Handling Explosives, Control Of Grade Of Ore, Transportation, Trackage, Water Supply, Power And Power Equipment And General Information Concerning Operation With Ore Reserve of 700,000,000 Tons Of 2.12 Percent Copper

CHUQUICAMATA, the largest and most important copper area in Chile, is situated in the northern part of the Republic, in approximately 23 deg. South Latitude, 69 deg. West Longitude and 263 kilometers in-

* Chile Exploration Co., Chuquicamata, Chile.

By WM. H. GOODRICH*

land from Antofagasta, to which it is connected by a railway. It is also accessible from Tocopilla, on the coast, by a 150-kilometer oil-surfaced road. The elevation at the mill is 9,000 feet above

sea level, and at the highest hill in the vicinity, 10,000 feet.

Copper was first discovered in this section by the early Indians long before the Spanish Conquest. This latter event was the cause of much early mining activity. During the period from 1500

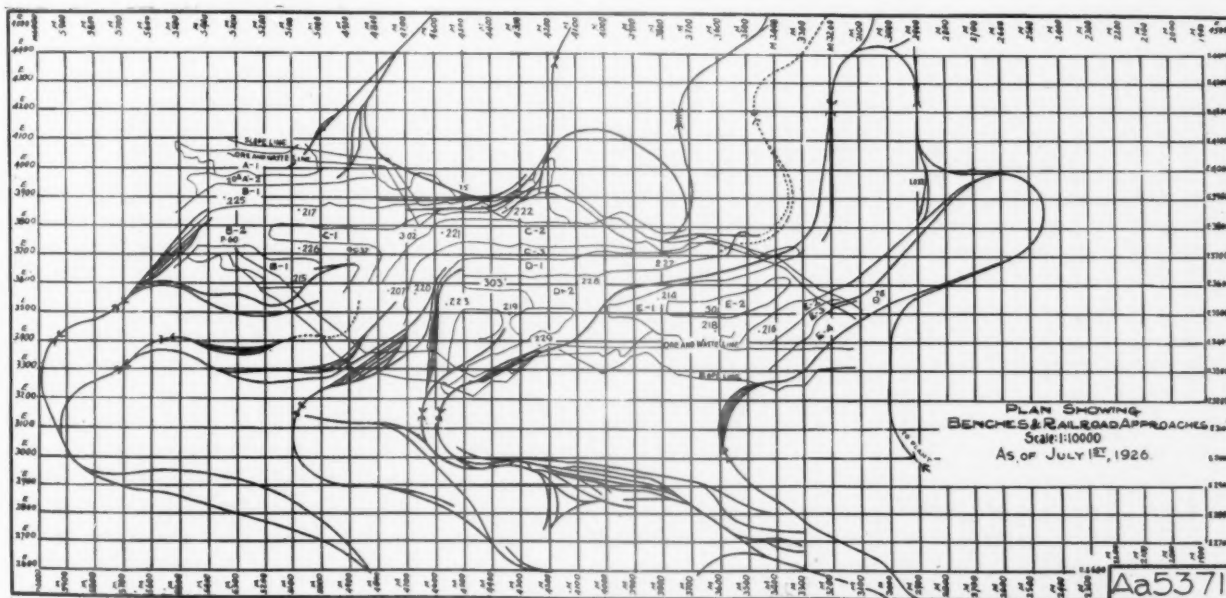


Fig. 1—Layout of Benches and Approaches

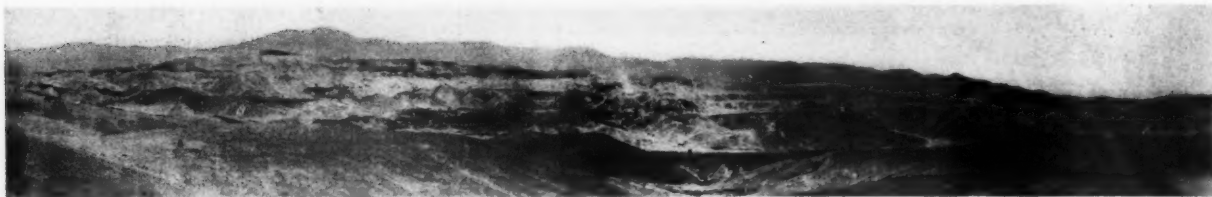


Fig. 2—Panorama of Mine

to 1912, the year in which the present development was started, a great many small mines were operating, "high grading" the narrow veins of brochantite and atacamite. The shipping of hand-sorted high-grade ores valuing up to 20 percent copper from these properties created a great deal of interest and resulted in numerous other discoveries.

It was not until the latter part of 1913 that enough proof had been established that an enormous body of ore exists at Chuquicamata. Until that time most of the work had been done along the veins, with only moderate results.

MINE DEVELOPMENT

Churn drill hole development was carried on during 1913 and 1914, after which it became apparent beyond all doubt that the large body of ore could be operated as a low-grade "open cut," or surface-excavation mine. The work was accomplished by the use of "Star" churn drills, some holes being drilled to a depth of over 1,000 feet, one reaching a depth of 1,680 feet, and also development tunnels crossing through the body at spacings of 50 and 70 feet, and at 100 foot intervals of elevation. This resulted in determining an ore reserve amounting to 700,000,000 short tons of ore containing 2.12 percent copper. This is divided into three classes—oxidized ore, mixed ore consisting of both oxides and sulphides, and sulphide ore.

All the present operations are carried on in the oxide section, encountering, here and there, a minor occurrence of mixed ore. None of the benches, however, have reached a sufficient depth to uncover an appreciable amount of the mixed ore. The sulphides, being at a lower elevation in the ore body, have not been reached by the shovel operations, nor will they be until some time in the future.

As the topography is fairly flat it was found advantageous to construct railroads entering from the north side, and

to attack the ore body in three different places. This plan opened up benches with very high faces, ranging from 100 feet to, in one case, over 200 feet high. Later, for economic reasons, it was found

and the laborers' camp in the distance at the right.

The preliminary examination of the property showed that the ore-bearing rock consists of a coarsely-crystalline quartz-feldspar mass included in the form of a huge lens within a biotite-hornblende granite. Fissures in the ore body were produced by subsequent chemical erosion advancing downward from the surface. The feldspar is highly decomposed in the leached zone and consequently has resulted in a softening, to some extent, of the rock at the surface. In the surface section of the mine better blasting results are more easily obtained, with a subsequent increase in shovel efficiency.

Operation

CHURN DRILLING

Churn drills are in use in Chuquicamata for blast hole work, which comprises over 90 percent of all primary blasting development. Figure 4 shows the No. 14 Cyclone special electric-traction churn drill used in this work. All drilling is done on the day shift, the holes being drilled to an average depth of 45 feet. Tunnel blasting is done where drilling is prohibitive or old development tunnels can be used to advantage.

On the lower benches the ground is hard and the standard practice is to drill 8-inch holes spaced at 12-foot intervals in rows and extending 1.5 feet below grade. These are column-loaded, without chambering, and shot.

On the upper benches, where the ground is softer and more shattered, the benches are drilled with 6-inch holes at approximately 30-foot spacing. These holes are usually chambered, in which case they are started with an 8-inch bit and continued until solid or non-caving ground is reached, when a length of 8¼-inch plain-end casing is set firmly on the bottom of the hole. Drilling is then continued with a 6-inch bit until the



Fig. 4—No. 14 Special Electric Sander-Cyclone Traction Churn Drill

advantageous to cut these down, by a system of thoro-cutting, to banks ranging from 40 to 50 feet in height.

Figure 1 is a map showing a somewhat diagrammatic layout of the approaches and benches. The numbers opposite dots indicate the positions of the shovels on the date the map was made, and the numbers opposite circles refer to prospect drill holes being drilled. Figure 2 is a panoramic view of the mine, and shows the topography thereat. Figure 3 is a panorama which shows the mine in the left distance, the "Foreign" or Staff camp and plant in the center,



Fig. 3—Mine, Leaching Plant and Camp



Fig. 6—320-B Bucyrus Electric Shovel, 8-yard dipper, Ward-Leonard control, loading into cars on bank above cut



Fig. 7—120-B Bucyrus Electric Shovel, Ward-Leonard control, 4-yard dipper. This shovel, although full-revolving, is in competition with the standard R. R. type

final depth is reached. As may be seen from Figure 5, the shoulder left at the bottom of the hole protects the casing from the force of the explosion necessary to chamber the hole. In some instances, however, casings are blown out of the hole, which necessitates moving the drill back to reopen the hole.

Holes drilled in the central section of the mine are subject to the nature of the ground, some shots following the column-loading system at narrower spacing, and others the chambered-system at slightly wider spacing. In short, throughout the entire mine the principle of loading and spacing depends upon the results obtained from experience gained in previous blasting.

Old casing is salvaged from the shots fired on the upper benches and these are cut into lengths of from 5 to 10 feet. They are used as starting casings in holes drilled through the harder rock on the lower benches, to prevent surface-caving of the 4 to 6 feet of ground broken by the blasts from the bench when the latter was immediately above.

A drill crew consists of a driller and his helper. Where a number of drills are working on a bench, a sub-foreman is in charge, who operates directly under the general drill foreman or his assistants. Sufficient oilers and pipemen are assigned to groups of drills to take care of the oiling and the supplying of water. There are two or three labor gangs continually at work making roads for the movement of the drills, cleaning sites for the commencement of operation, salvaging casings, and handling material.

All bits are collected or distributed at night by means of a small locomotive and two flat cars equipped with jib cranes. Stems, fishing tools, and casing are handled in the same manner. Where long moves are necessary, drills are loaded onto flat cars by cranes and transferred to the next location. This is done without dismantling the drill. All churn drill bits are sharpened in a central shop by a power sharpener.

A calyx core drill is in operation, drilling prospect holes in various parts of the mine. Owing to the presence of oxide ores near the surface of the body, water is not used because of danger of the samples becoming salted. This problem has been met by using compressed air, and drilling a dry hole. The air is introduced into the center of the rods at a pressure of 60 to 110 pounds and it removes the cuttings from the bottom of the hole.

At present there are 68 No. 14 Cyclone

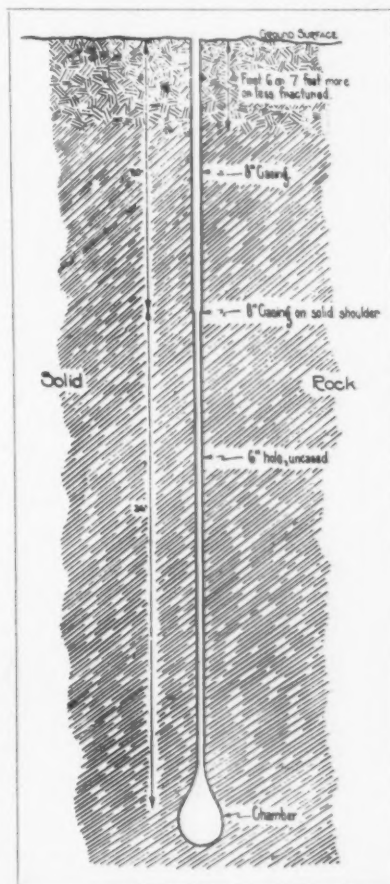


Fig. 5—Typical Chambered Drill Hole

drills operating. The original 20 drills were equipped with a 10-horsepower motor handling a 4½-inch tool string. These machines are being rebuilt to actuate by a 15-horsepower reversible induction motor, and in a short time all of the drills will be so equipped and will handle a 5-inch tool string weighing approximately 1 ton. At that time all drills will be standard in all mechanical and electrical parts. The tools used are similar to oil-well cable tools, swinging on 2½-inch Manila hawser-lay cable. The strings average 25 feet in length; jars are not made up with the tools, being used only when fishing, or where experience has taught that they are necessary. A regular pattern dart valve bailer attached to a ¾-inch sand line cable is used to clean out the holes.

EXPLOSIVES HANDLING

Two well constructed box cars are employed to distribute dynamite around the benches and between the large magazines, together with two small gondola cars for gathering tools, empty dynamite boxes, etc., and for the accommodation of the powder handling gang. There are two small flat cars placed between the locomotive and car of explosives to reduce the impact between the two.

Explosives are distributed every day to the powder foremen loading primary shots, and also a small quantity to the bench powder magazine from where it is in turn distributed to the bench storehouses for ready use in secondary blasting. This allows quick access to the dynamite and fuses and does not result in a great amount being left around the mine thereby increasing the danger from that source.

PRIMARY BLASTING

Top and toe of banks are located by the engineering staff and drill holes are "spotted" to produce the best breakage of ground and at the same time preserve the symmetry of the bench face. While the holes are being drilled, a calculation of the burden and powder requirements is made by the engineers.



Fig. 8—Marion 92-E-S Electric Shovel, standard R. R. type, 4-yard dipper, Ward-Leonard control



Fig. 10—Oil Tank Car for locomotive service

Tunnel charges are determined according to the respective burden they carry and are loaded accordingly.

There are four powder gangs of 15 to 20 men each, and under the direct supervision of a foreign foreman; these gangs load all the primary shots.

The arrangement of the holes on established benches depends directly upon the shape and hardness of the bank to be broken. Where there is a heavy long toe, machine drill holes, inclined 5 or 10 degrees from the horizontal, are drilled to an average depth of 24 feet from the face. These holes when shot break the base of the bank that otherwise might leave a ridge of solid rock, to be encountered later by the shovels. The toe holes are shot in conjunction with the bank or churn drill holes as one complete shot.

In the upper or decomposed section of the mine, where the banks are softer, all holes are chambered heavily to take a

charge of from 3,500 to 4,000 pounds of black powder. A duplex rubber-covered leading wire of No. 14 gauge, having an electric blasting cap embedded in a 3 by 4-inch cartridge of 60 percent dynamite attached to the end, is let down each hole as a detonator. The powder charge is then poured in and the hole filled to the collar with tamping, which consists of tailings from the mills crushed to pass a $\frac{3}{8}$ -inch mesh. From 8 to 10 holes are connected in series, and these in turn are connected in parallel, and the leads brought to the blasting car. Two caps are placed in every charge, each separately connected in parallel to a pair of leading wires. Each circuit is tested with a Wheatstone bridge and those giving low resistance have blasting caps inserted until they are brought up to balance with the higher resistance circuits. In this way the same amount of current is assured to pass through each circuit. A special type of armored

blasting car is used, which contains three variable voltage transformers to convert the 500-volt current on the benches to the proper voltage for blasting. All blasts are fired by electricity from this car.

In the lower or harder section of the mine, bank holes are drilled with narrower spacing and at times are lightly sprung. The dynamite charge is placed in the bottom of the hole, or partly distributed up the barrel depending upon the character of the bank. Cordeau Bickford fuse is used as a detonator, and for connection between holes. It is lowered to the bottom of the hole before the charge is put in and from 1 to 3 feet allowed to project from the hole. The fuses in all holes are connected to the trunk line of Cordeau and from two to four electric blasting caps are placed at exposed ends of this line.

All tunnel shots are loaded with black powder, as much as 10,000 pounds being loaded into one charge. These charges are detonated with electric blasting caps, two caps being placed in each charge. The ground is broken with large blasts, from 70,000 tons to 1,000,000 tons being broken at one time. The length of the shot along a bench ranges from 300 feet to 2,500 feet.

Just before a shot is to be fired all men in that vicinity are so advised and they move away to a safe distance. A locomotive is used to warn everyone of a blast. It is moved along near the shot blowing a series of short blasts and when in the clear, one long blast is blown and the shot is then fired.

UNDERGROUND WORK

All tunnels are driven for use in tunnel blasting, or for prospecting the ore body. Where a great amount of loose material lies above the natural ground,

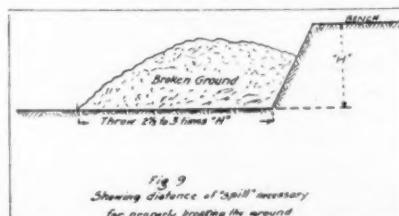


TABLE 1—TYPES OF SHOVELS

No. in Service	Manu- facturers	Type	Actuated by	Cur- rent	Size of Dipper	Mounting	Remarks
2	Bucyrus	225-B Full Revolving	Electricity	A. C.	8-yd.	Railroad	"Hoist Cable" Drum
1	Bucyrus	320-B Full Revolving	Electricity	D. C.	8-yd.	Railroad	"Hoist Cable" Drum
9	Bucyrus	103-C Railroad	Electricity	A. C.	4-yd.	Caterpillar	Two-men operated
4	Marion	92-E S. Railroad	Electricity	D. C.	4-yd.	Caterpillar	Two-men operated
3	Marion	92-E Railroad	Electricity	D. C.	4-yd.	Caterpillar	Two-men operated
1	Bucyrus	120-B Full Revolving	Electricity	D. C.	4-yd.	Caterpillar	One-man operated
1*	Bucyrus	95-B Railroad*	Electricity	A. C.	3-yd.	Railroad	Two-men operated
3	Bucyrus	30-B Full Revolving	Diesel Eng.	....	1-yd.	Caterpillar	One-man operated
1	Bucyrus	95-B Railroad	Steam	....	3-yd.	Railroad	Two-men operated
24—Total							

*Converted from steam to electricity at mine shops.

TABLE 2—SHOVEL PERFORMANCE
(January, 1926, to May, 1926, Inclusive)

	Shifts		Tons Loaded		Tons Per Shift	
	Ore	Waste	Ore	Waste	Ore	Waste
Standard D. C. Shovels.....	593.625	491.375	880,170	747,282	1,483	1,521
Standard A. C. Shovels.....	776.250	1015.750	1,221,576	1,511,374	1,574	1,488
300-T A. C. Shovels.....	295.0	51.0	705,827	66,737	2,393	1,309
300-T D. C. Shovel.....	113.875	39.125	249,895	54,113	2,194	1,383

Since this tabulation was made there has been an increase in shovel efficiencies. The performance for the months of June, July and August, 1926, is given below.

	Shifts		Tons Loaded		Tons Per Shift	
	Ore	Waste	Ore	Waste	Ore	Waste
Standard D. C. Shovels.....	409.750	458.250	675,516	921,356	1,649	2,011
Standard A. C. Shovels.....	597.625	485.375	1,030,344	772,806	1,724	1,592
300-T A. C. Shovels.....	73.375	98.625	191,000	205,992	2,603	2,088
300-T D. C. Shovels.....	152.000	.....	338,855	.....	2,220	.....

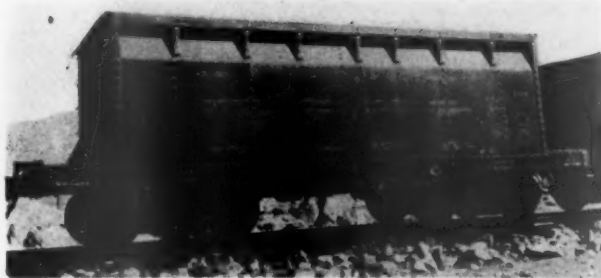


Fig. 11—70-Ton Ore Car. Top dump for use in lifting or revolving car-dumper



Fig. 12—20 Cubic Yard Air Dump Waste Car

such as spills from other shots and old dumps, or where the ground is so steep or rough as to make it costly to move churn drills, cross-cut tunnels with opposite arms are driven at an elevation slightly lower than the bench to be shot. The cross-cut tunnels are driven 4 by 5½ feet and the arms 3 by 5 feet.

SECONDARY BLASTING

The blasting of large rocks, hard toes, tight banks, etc., is handled by a secondary blasting crew. This crew is directed by a foreman and his assistants and is distributed over the first and the third shifts. When a shovel encounters rocks too large to pass the dipper doors they are dropped to the bank side of the shovel and passed by. The day or first shift secondary blasting men drill these rocks, together with any other large ones protruding from the slope, with jackhammers. They also prepare "gopher" holes, drive small dog tunnels and drill toe holes in very tight banks and hard toes, thereby preparing the banks, as much as possible, for good loading in order to increase the shovel loading rate. The third shift secondary blasting men work in the shovel cuts that are hard or tight and prepare them for the next day's shovel operation. They do all the loading and shooting of secondary blasting, and thus eliminate the danger and delay from this work in the daytime when many men are on the hill.

CONTROL OF THE GRADE OF ORE

In the lower-grade sections of the mine, the ore is not uniform, and consequently, as the shovels move through

these sections it is necessary to know whether they are loading ore or waste. Grab samples are taken from the cars loaded, one sample consisting of a representative grab from 2, 3, or 4 ore cars, or one train of waste cars. These are immediately taken to the small laboratory at the mine and assayed; results usually being obtained within 45 minutes. Each hour an average assay of the ore being loaded from all shovels is reported and this aids in determining how the grade is checking up with that asked for by the plant. Shovels detailed to operate the second shift are determined from the amount and grade of ore loaded the first shift and with the idea of maintaining a proper balance in the operations of the mine. A crew of 15 to 17 samplers is employed in each of the two loading shifts. They are oc-

cupied continually between the laboratory and the shovels taking samples of the cars loaded. The laboratory employs five men on each shift to grind and assay the samples.

SHOVEL OPERATIONS

The types, etc., of shovels used, are shown in Table 1. This is self-explanatory. Figure 6 of the 320-B Bucyrus shovel, Figure 7, of the 120-B Bucyrus shovel, and Figure 8 of the 92-E-S Marion shovel, are illustrations of typical shovels. Table 2 gives the performance of the various types of shovels for 8 months of 1926. The distribution of the operating and non-operating time of the shovels is shown in Table 3, from which it will be seen that the shovels are actually engaged in loading 52.5 percent of the operating time.

TABLE 3—PERCENTAGE DISTRIBUTION OF OPERATING TIME

Shovel Nos.	Loading	Waiting Cars	Reprs. Mech.	Reprs. Electr.	Moving	Blasting	Cleaning	Idle	Derailments	Fixing Track	Miscel.	Total Oper. Shifts
222-228.....	52.2	17.5	5.4	3.2	1.1	6.7	3.6	2.7	1.4	2.9	3.3	1085.0
204-221.....	51.9	16.5	5.5	3.5	1.4	7.3	3.0	2.5	2.5	2.4	3.5	1792.
301-302.....	55.6	15.6	6.1	5.1	1.9	3.9	1.4	4.6	1.3	1.0	3.5	346.
303.....	54.5	21.1	1.5	5.0	1.1	1.7	1.7	1.7	3.6	3.9	4.2	153.
Total—100 Percent												3376.

PERCENTAGE DISTRIBUTION NON-OPERATING TIME

Shovel Nos.	Casting Cleaning	Field Repairs	Moving	Idle	Shop	Percent Operating	Total Non-Oper. Shifts
222-228.....	4.6	8.2	5.5	52.9	23.8	61.0	691.0
204-221.....	3.3	9.5	9.0	57.1	21.1	69.3	292.0
301-302.....	4.8	41.2	10.5	43.5	...	67.1	170.0
303.....	16.9	10.2	29.9	43.0	...	59.3	105.0
Total—100 Percent							1758

TABLE 4—TYPES OF LOCOMOTIVES

No. in Service	Manu- facturers	Year Built	Type of Locomotive	Weight in Working Condition	Size of Cylinders	Dia. of Drivers	Boiler Pres- sure	Remarks
10	Baldwin Loco. Wks.	1925	Mikado 2-8-2	91 tons	Inches 19 x 26	46	200	Side tank, superheaters, 11" compressor, Walchert valve gear.
16	Am. Loco. Co.	1910*	Mogul 2-6-0	85 tons	19 x 26	54	175	Saddle Tank, Stevenson link motion, 11" compress.
3	H. K. Porter Loco. Wks.	1920	Mikado 2-8-2	87 tons	19 x 26	48	190	Side tank, superheaters, 11" compressor, Walchert valve gear.
8	H. K. Porter Loco. Wks.	1914-15	6-wheel Switchers 0-6-0	55 tons	17 x 24	46	175	Saddle tank, Stevenson link motion, 9" compress.
2	H. K. Porter Loco. Wks.	1919	4-wheel Switchers 0-4-0	26 tons	12 x 18	36	150	Saddle tank, Stevenson link motion, 9" compress.
1	Baldwin Loco. Wks.	1917	Prairie 2-6-2	85 tons	19 x 24	46	175	Side tank, Stevenson link motion, 11" compress.
40—Total								

*Rebuilt in the U. S. Government R. R. yards at Panama. Originally built for Trans-Siberian R. R., 1905.

The 16 American "Mogul" type were converted from tender to saddle tanks in the company's machine shops at Chuquicamata.



Fig. 13—Spreader Plow in action on dump



Fig. 14—Track Shifter

The locations of the various shovels on the benches are determined by the operating staff beforehand by the use of a mine program as a guide. This program deals with the amount and grades of ore and waste on the various benches as previously ascertained from drill hole sections and assay plans. Forecasts are made from time to time and the program is consulted to determine the assured tonnages of ore, and the waste to be removed to get to the ore. The program has been found to be a great help in forecasting the development of the mine for future operation.

The shovels are placed in the banks after each large shot to either make a casting cut for the load tracks, or to load. Sometimes the spill from the shot is not heavy enough to require a standard shovel, then the smaller type Diesel-driven revolving shovels, with one-yard dippers, are used to make the cast. The track is then relaid and loading commenced. From six to eight loading cuts of this nature are required to clean up the shot. The load track is then torn up and carried to either side in the clear of the succeeding shot. The removal of loading tracks in front of shots has been found necessary because to properly break the ground sufficient powder must be used that the resulting spill is from 2.5 to 3 times the height of the bank; viz, that the total throw from the toe of the newly-blasted face to the edge of the broken ground is 2.5 to 3 times the height of the face; sketch Figure 9, illustrates this.

The shovel crew consists of a runner, craneman, pit boss, and driller with sometimes one extra pitman when the cuts are hard and a great amount of drilling has to be done. Two shovel loading shifts are operated, one from 7 to 3 in the daytime, the other from 3 to 11 in the evening. A third or night shift from 11 p. m. to 7 a. m. is used for all secondary blasting of the cut and any special work that can then be done and would otherwise interfere with the loading shifts.

Each morning the mine receives the requirements for the day from the reduction department and from this evolves the program of procedure. This information determines the number of ore and waste shovels to be worked; the assignment also depends upon the grade of each shovel, speed of loading, and interruption to contend with in any particular section of the mine.

TRANSPORTATION

The locomotives used in all classes of service are listed in Table 4. All locomotives burn fuel oil and the fueling on the benches is done with a 10,000 gallon tank car having an overhead feed pipe and operated by compressed air shown in Figure 10; the average time for loading a locomotive oil tank is 6 minutes. Stand-pipes for the watering of the locomotives are at all yards and sidings. The larger type of locomotive operating on the upper benches has fuel capacity for about 20 hours and can therefore work

through the two operating shifts without having to refuel.

Figure 11 of the 70-ton ore car, and Figure 12 of the 20 cubic yard air-dump waste car, show standard equipment.

During the night shift locomotives are tied up on various benches to serve the shovels the first thing in the morning. These locomotives are hosted by hostling crews in the different yards and the engine crews go to these yards and immediately start their locomotive for the shovel assigned to them. All other locomotives are tied up in the general roundhouse at the mine shops.

A number of locomotives are used during the night to take from the shovels all loaded ore and waste cars and replace them with empties. These loads are placed in the nearest yard to be taken to the general assembly yards the following morning. These same locomotives are also used for general switching around the different benches and the last thing during the shift they refuel and water for the following day. Thus it is that each shovel in the morning has a train of empty ore or waste cars with a locomotive ready for the day's work.

Locomotives are sent to the roundhouse at least once every two weeks for a washout and minor repairs. All running repairs are handled in the various yards serving as hostling stations. Always there are from one to three locomotives undergoing general repairs at the plant or mine shops.

The larger type locomotives are gen-

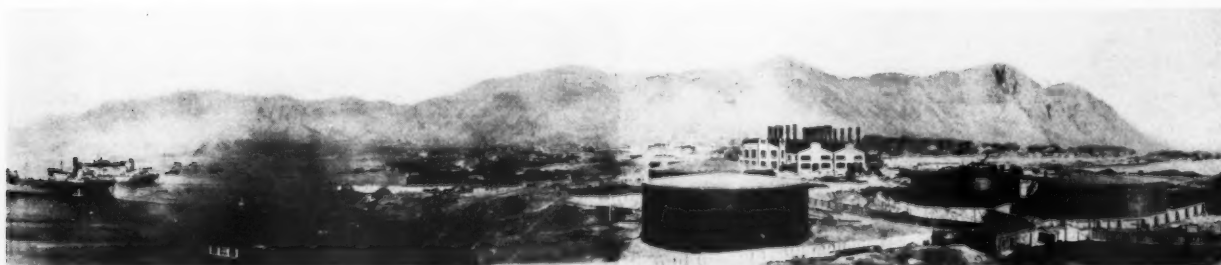


Fig. 16—Tocopilla, showing oil-burning power plant

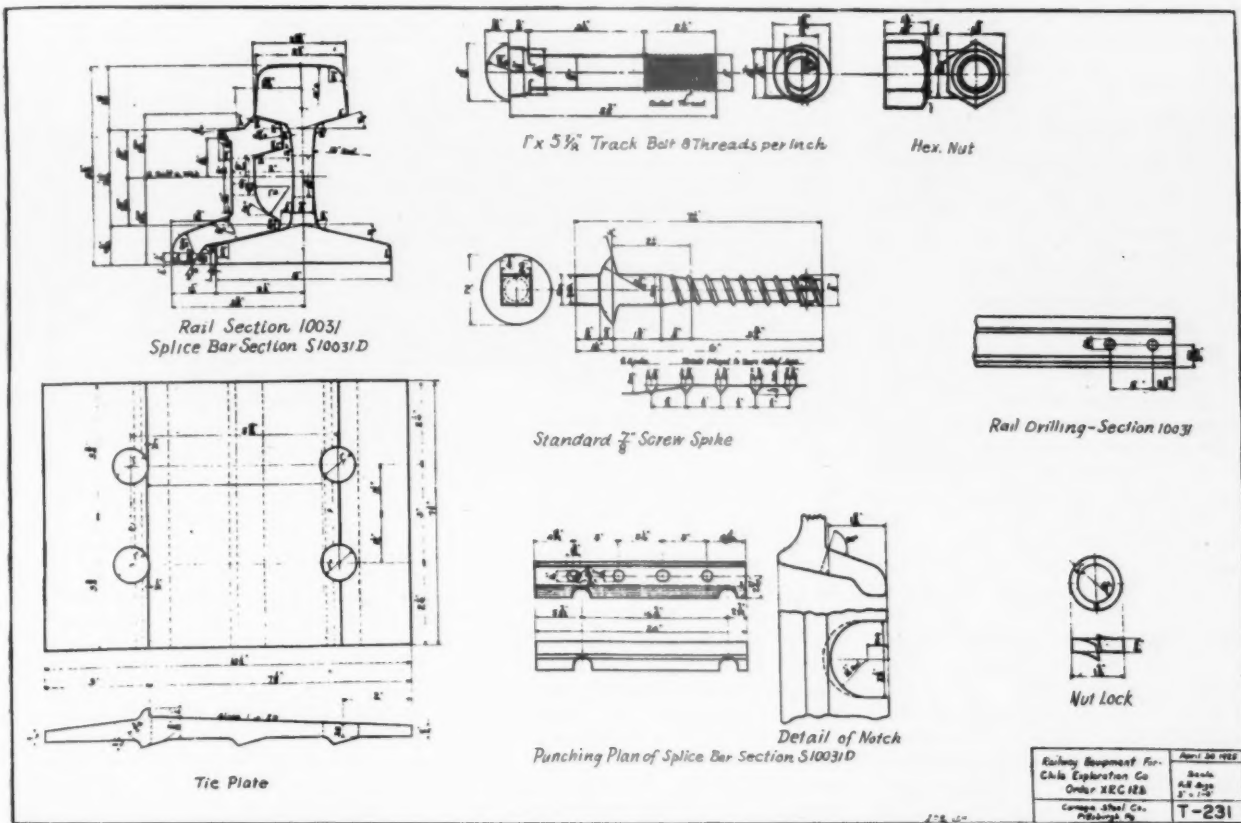


Fig. 15—Track Material

erally in service hauling ore trains, together with the waste trains on the upper benches, and as before explained, this assignment is because of their large fuel oil capacity.

A yardmaster is placed in charge of all traffic; his duties being to send locomotives to the various shovels in accordance with best locomotive distribution. He takes care of all special work, such as powder trains, machine shop service car, cranes and extra duty locomotives. Any change in locomotives due to failure, bad sections of track, shovel breakdowns, etc., are handled by the yardmaster and he uses his own judgment where to send the locomotives that become available.

Any extra duty required by any department of the mine calls upon the yardmaster for one or more locomotives necessary for the work in question. The mine is divided into two equal sections and the yardmaster makes no attempt to remove either ore cars, waste cars, or locomotives from one section to the other without the approval of the general foreman. This is done to eliminate any movement that may be unnecessary.

Traffic is controlled away from the benches by telephone exclusively, the telephones being placed at all important yards and sidings. Traffic on benches is controlled by hand signals. Whenever trains are ready to leave from one con-

trol point to another, the locomotive engineer signals by blowing his whistle and the dispatcher in charge ascertains the right of way over the telephone and sends the train to the next control point. The traffic is so controlled that trains leave from any one point to the other with the greatest dispatch and least interruption.

All workmen arrive on a crew train from the town-site and are discharged at a central point in the mine 20 minutes before the shift starts, thus giving everyone an opportunity to arrive at his particular work promptly at the beginning of the shift.

Insofar as possible locomotives are assigned to the various sections of the mine permanently in order that the train crews shall be familiar with the grades, condition of the track, etc. No attempt is made to assign any number of locomotives to any particular shovel. Shovels in hard cuts loading ore with short hauls are assigned one locomotive, the last car of the train being left at the shovel to be loaded while the locomotive switches empties back to the shovel. Shovels in soft cuts with long hauls are assigned up to four locomotives to give the necessary service. Waste dumps are located at the nearest convenient gulches to handle material with the shortest haul. The maximum

waste haul is 2 1/4 miles and the minimum is one-half a mile.

Ore trains are assembled in four different yards situated close to the bench operations from where the main line locomotives take them to the plant. Car inspectors are assigned to the different yards to inspect all ore and waste trains.

WASTE DUMPS

When a dump is ready to receive waste the trains are dumped nearest to the shovel bench and continued on out to the end. This is done to eliminate the danger of placing a locomotive on open loose track.

When the dump is filled completely, a spreader plow shown in Figure 13; and track shifter shown in Figure 14 are used to clean up and shift track to the edge of the dump. Gangs of 12 men are used to dump cars, ballast, and keep track in shape.

All waste hauled from any one dump comes from a bench on the same level or above, so that no waste has to be hauled up grade. Trains are operated with from 5 to 14 cars of 12 or 20-yard capacity depending upon the dumping facilities.

Trackage

All mine tracks are of standard gauge. A switch-back system has been constructed on the north side of the mine, laid with 90-pound rails, maximum curva-

ture of 8 degrees metric, and with a maximum gradient of 3 percent. All tracks to waste dumps leading from these switchbacks are laid with 80-pound rails, on level grade, and with maximum curvature of 12 degrees metric. The south side of the mine is now accessible with a main line loop system laid with 100-pound rails, maximum curvature of 8 degrees metric and 2.6 percent grade.

The 100-pound rail is of the Pennsylvania standard section, which differs from the A. S. C. E. section in having a differently shaped head, which the mine officials believe to be better adapted to withstand wear, and also in having a different distribution of weight.

The approach tracks from this main line to the benches are laid in 90-pound rails, level or 2.6 percent grades and maximum curvature of 8 degrees metric. All bench tracks are laid with 80-pound steel, curvatures and grades to fit the local conditions. All benches are level except one, which lies on a 3 percent grade. There are approximately 32 miles of single track lines carrying the ore and waste traffic.

Tie-plates having a 1 in 20 cant are standard, and on all main line and approach work, instead of the customary square spike driven into the tie, $\frac{3}{8}$ -inch by $7\frac{1}{2}$ -inch screw spikes are used. They are screwed into a hole previously bored into the tie by means of a compressed air auger. Figure 15 gives the dimensions of standard track material.

Water

Fresh water is piped in from the higher Andes, 100 kilometers east. It is of very good quality for culinary purposes and use in steam boilers. A brackish water is piped in from 60 kilometers east and is used in all fire lines at the mine as well as the washing out of boilers.

Power and Power Equipment

Electric power is supplied by the company's six-unit oil burning steam turbine plant at Tocopilla, which is shown in Figure 16. There are four Siemens-Schukert 10,000 K.W. units, one General Electric 10,000 K.W. unit, and one 20,000 K.V.A. General Electric unit. Power is generated at 5,000 volts and stepped up to 110,000 volts for transmission 144 kilometers to the plant. Here it is transformed down through a General Electric 5,000 K.V.A. 3-phase transformer in the main sub-station and transmitted to the mine at that voltage by aerial lines carrying 4/O B & S bare stranded copper wire. Taps are taken off at the entrance to each bench through hand-operated circuit breakers located on poles. The current is then carried through 3-conductor, 300,000-cm. steel-banded cables over the benches. At every 500 feet along this main feeder

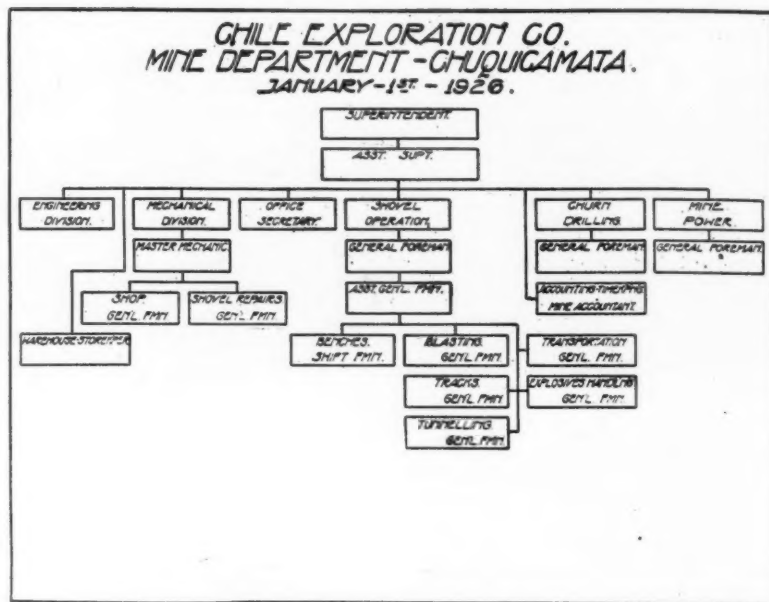


Fig. 17—Organization Chart

cable is located a sectionalizing house with disconnects so arranged as to supply power at each side. These houses are made of $\frac{3}{8}$ -inch steel plate equipped with a double set of disconnects and hand-operated oil circuit breakers. They are constructed of a standard size 2 feet by 4 feet, and 5 feet in height, and equipped with hooks in the top so as to be readily moved by the cranes. A 11,500-v. insulated rubber-covered 3-conductor trail cable leads from each shovel to the sectionalizing house.

In the rear of all alternating current shovels are placed three 125-K.W., 5,000-500-volt single phase transformers to deliver current to the motors. The latter are of the heavy duty mill type, alternating current variable speed induction motors having secondary resistance for speed and torque control. This control is of the magnetic type with automatic clappers for limiting the overload. Westinghouse Cutler-Hammer rheostatic control equipment is standard on all A. C. (Continued on page 914)

TABLE 5—TONNAGES AND GRADES SINCE BEGINNING OF OPERATIONS

	Short Tons to Plant	Percent Cu.	Short Tons to Stock Pile	Percent Cu.	Short Tons to Dumps	Percent Cu.	Total Short Tons
Total to 1915.....	.....	.....	.....	.....	66,482	0.61	66,482
Year 1915.....	636,482	1.85	.....	.....	305,395	0.72	941,877
Year 1916.....	1,733,450	1.67	.....	.....	580,997	0.62	2,314,447
Year 1917.....	2,902,468	1.71	.....	.....	318,890	0.50	3,220,858
Year 1918.....	8,749,022	1.85	.....	.....	1,203,730	0.37	4,952,752
Year 1919.....	2,959,801	1.64	.....	.....	1,363,378	0.37	4,323,179
Year 1920.....	4,244,760	1.54	.....	.....	1,354,048	0.30	5,598,808
Year 1921.....	1,676,217	1.679	145,769	0.85	965,053	0.54	2,787,039
Year 1922.....	4,369,977	1.683	64,927	0.91	1,516,178	0.46	5,951,082
Year 1923.....	7,067,006	1.666	44,241	0.80	4,243,710	0.46	11,354,957
Year 1924.....	7,227,594	1.637	.....	.....	5,617,910	0.41	12,845,504
Year 1925.....	7,778,910	1.592	.....	.....	5,400,221	0.47	13,179,131
January, 1926.....	613,995	1.536	.....	.....	549,975	0.46	1,163,970
February, 1926.....	565,345	1.598	.....	.....	562,038	0.47	1,127,383
March, 1926.....	671,412	1.600	.....	.....	587,394	0.49	1,258,806
April, 1926.....	578,278	1.494	.....	.....	458,509	0.37	1,036,787
May, 1926.....	658,958	1.435	.....	.....	413,959	0.39	1,072,917
June, 1926.....	740,088	1.504	.....	.....	552,162	0.42	1,292,250
July, 1926.....	751,549	1.439	.....	.....	686,917	0.41	1,438,466
August, 1926.....	744,078	1.587	.....	.....	661,075	0.41	1,405,153
Grand Total ...	49,669,390	1.605	254,937	0.85	27,407,521	0.46	77,331,848

TABLE 6—MAN SHIFTS WORKED, FROM THE INTERIOR PAY ROLL DURING JANUARY, FEBRUARY, MARCH AND APRIL, 1926

Department	January	February	March	April	Average
Development and Blasting.....	13,784.01	12,415.26	14,072.00	12,635.88	13,226.79
Shovel Operation.....	8,410.25	7,918.50	8,629.00	8,098.87	8,264.15
Locos. and Train Service.....	8,782.75	8,478.62	9,458.50	8,865.50	8,895.09
Track Maintenance and Const.....	6,239.63	6,862.62	7,711.37	4,100.99	6,228.65
Machine Shop.....	10,715.62	9,702.62	10,383.75	9,547.75	10,087.43
Electric Shop.....	4,493.25	4,062.00	4,366.80	3,906.63	4,182.17
Engineering and Statistics.....	2,123.25	2,095.69	2,295.75	2,216.85	2,182.59
Miscellaneous.....	12,626.74	12,269.50	12,347.63	12,936.28	12,545.04
Total Mine.....	67,175.50	63,804.81	69,259.80	62,208.75	65,612.21

THE PROGRESS OF LEACHING AND ELECTROLYTIC METALLURGY*

The Whole Subject Of Roasting And Leaching Has Progressed Now To A Point Where It Demands The Highest Type Of Chemical And Metallurgical Energy—Physical Chemistry Must Be The Basis Of Our Future Progress

By M. F. COOLBAUGH†

I DO not wish that you should realize that all metallurgists are in harmony as to their methods of treating metals. If they were in harmony it would probably mean lack of progress. We can divide them into two classes—the pyro-metallurgist, or the metallurgist using fire means, and the hydro-metallurgist, or those using leaching methods. Conflict is always good for progress; we have it in politics, and we might say we have it in religion; and we have our fundamentalists, and those who are not fundamentalists. As representing the pyro-metallurgy, may I express the hope that it may not be classed among the fundamentalists.

The leaching of ores is not new. The leaching of ores for the recovery of metals, however, is quite new. The older leaching was simply to recover the salts.

Agricola, back in 1555, I think it was, outlined a great many methods of leaching for the recovery of salts. They called them solid juices at that time. There was no real competition, however, between leaching methods and fire methods at that date. The real competition started at a much later date, and it has been given its greatest impetus I might say not by the metallurgist but by the electrician. The electrical engineer, not in an attempt to help out in the recoveries of metals, but in an attempt to get cheaper energy, has made an energy which can be applied to the recovery of metals very readily. He has worked with the water power and has cheapened the cost of electricity. He has worked with coal and he has cheapened it through that source.

Twenty-five years ago, in the State of Colorado, a power plant was erected using fuel—coal—with a guarantee that it would produce a kilowatt hour of electricity for 100,000 British thermal units. That, for a good coal, represents about seven pounds. Today we have in the State of Colorado a plant running regularly that is producing a kilowatt hour of electricity for 17,000 British thermal units, or about 1.2 pounds of coal.

We see an enormous increase in the efficiency or production of electricity, and, as I said before, the electrical engineer did not do this primarily from the standpoint of metallurgy, but he gave

great impetus to the metallurgist, in that electricity is and undoubtedly will be the best means for the recovery of metals. It is one of the best means for the recovery of metals, because it is constant—it can be used constantly, and it does not fluctuate over wide areas. It gives a chance for cheap labor costs for metallurgical purposes, because one man can handle a great many electrical units, and finally it produces metals of a very high grade.

We can not see any reduction in costs comparable with those of electricity in the pyro-metallurgy; almost the same quantity of fuel—coke and coal—is used at the present day as was used 25 or 50 years ago. We do not see the great improvements in the slags of the pyro-metallurgy today over past years.

It is said that the old Roman slags contained as small values as the present slags. These slags, as you all know, were made in the real tinta ores. Therefore, it is up to the pyro-metallurgist to look to his laurels in the improvement of his processes if he is not to be supplanted by leaching and electrolytic methods.

Coming more closely to leaching: Leaching had its beginnings with gold and silver ores; it had its big start as a metallurgical process when the cyanide method of treatment was discovered. It was slow in developing, but during this development the mechanical engineer came to the aid of the metallurgist. He invented many machines for handling large quantities of material in the form of pulp—that is, the solids and the liquid mixtures—the thickener, the agitator and the filter were invented by the mechanical engineer to handle these materials that were being treated by the cyanide process.

Not only did the cyanide process start us along that line, but it started chemists. The chemists began to study carefully the nature of the solutions—the chemical reactions that were taking place—the impurities and how those impurities could be eliminated; and the metallurgist began to reason thus: If we can treat ores containing gold and silver by hydro-metallurgical methods, can leach them and get their values, why can we not apply this method more universally to the recovery of the other metals?

In the recovery of the other metals we

started with the oxidized ores. These are naturally the easiest ores to treat; they require some cheap solvent, and many of the oxidized ores will respond to such treatment and a larger percentage of their values will go into solution.

For a time, and especially with recovery work, it was reasoned that we could draw these metals out of solution by using another cheaper metal, allowing that to go into solution, such as iron, but, as I said, when electricity began to come into common use, it was realized that it was one of the best and one of the cheapest methods that could be used for the recovery of these metals.

To get down to a much more recent date in leaching: It has come on as a very practical method of gaining our metals within the last 10 or 15 years. It has spread from the oxidized ores to the unoxidized ores, and it is this field that I wish to take up more fully.

The unoxidized ores, or the sulphide ores, require treatment before they can be leached. I do not wish to be too specific on that; there are reagents that will react with the sulphide ores and take the values into solution, so to speak. These reagents, however, are not cheap, and while we may have processes in the future that will relieve us from this preliminary treatment, there is no indication now that this will come quickly into use.

The roasting of the sulphide ores is now considered as absolutely imperative for the preliminary in leaching, and, for example, I will say that the work on roasting of complex or zinc ores has progressed probably farther at Anaconda and the Consolidated Mining and Smelting Co., and by our Australian companies than at any others.

When this work was started it was considered that all you had to do was to roast an ore and treat it with acid—sulphuric acid was generally used—and that the values would generally go into solution. The metallurgists in the audience remember how they have roasted copper ores and were surprised that not nearly all the values went into solution. A study of the question has shown that many compounds may be formed in the leaching of ores that make them even more insoluble than they were in the roasting of ores, that make them more insoluble than they were before the roasting was commenced. This has opened up a new line of study to find out

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† President, Colorado School of Mines.

what these insoluble compounds are, how they can be prevented in their formation, or how they can be treated if they are formed, with some type of reagent which will dissolve them.

I quote from the Anaconda Co., because they are the closest to us—and best known. They found in the roasting of their zinc ores that it was necessary to keep a very low temperature to keep the iron content away from the zinc ores; otherwise, the iron united with the zinc in the process of roasting and formed compounds which are known as ferrites or ferrates, which are quite soluble in acid and in diluted shape almost insoluble, which precludes high recoveries.

This has been one of the bugbears of the leaching world for the last 8 or 10 years. It has demanded that we get purer and purer concentrates and that we eliminate more and more of the iron from these concentrates. Ore dressing has come to the aid of the metallurgist in this way, and it has eliminated more and more of the iron and get higher and higher concentrates. However, there is one type of iron that the ore dresser can not eliminate, and that is iron that occurs in a molecular state, and that is a zinc itself, or, rather a form of zinc ores known as marmatites, wrought from the iron, which is so chemically associated that the flotation man has no chance whatever to eliminate that from the zinc in any ore dressing method.

Methods are being experimented upon at the present time in Denver that indicate that roasting can be effected without the formation of these detrimental insoluble compounds. It has been found that if in the roasting process the ores and the air for oxidation travel in the same direction throughout the roasting process, the sulphur gasses produced will prevent the formation of the zinc-iron compounds which are insoluble; and to go a little farther in this and make it more general, as to the compounds of zinc and iron which are insoluble and which have been found so detrimental in the metallurgy of the zinc, similar compounds are formed with iron and copper in exactly the same way; so it is not impossible to tie up all of the copper in a concentrate in an insoluble form by roasting it. When I say "all"—and I mean that in the strict sense of the word—roasting that in certain temperatures and under certain conditions, instead of liberating the copper, will tie it in a compound more difficult in solution than the original compound of the copper itself, until now in this method of roasting the ore and the air for roasting, the products of the roast, and the gasses produced in the roasting all travel in the same direction through the furnace, and these compounds do not tend to form, and if they do tend to form, they are

decomposed as they get toward the end of the roasting operation.

This type of roasting produces in the upper and middle part of the furnace a maximum quantity of sulphates, sulphates which in themselves are water soluble, and in many of our leaching methods it is not desirable to have this large quantity of sulphate present. Experimentation, however, has shown that this method of roasting can be used and at the same time regulate within very close limits the quantity of water-soluble sulphate that is produced in the final product. This is done by introducing an appreciable quantity of raw sulphide ore toward the end of the roast.

The introduction of this rather large quantity of sulphide ore toward the end of the roast answers two purposes: It breaks the sulphate formed and it makes a temperature control which will prevent the formation of the insoluble or ferrite compounds.

The whole subject of roasting and leaching has progressed now to a point where it demands the highest type of chemical and metallurgical energy. Physical chemistry must be the basis of our future progress. That is probably a broad statement, but it is likely to be the basis of our future progress.

The study of surface effects influences very largely the roasting operation. We have all heard in recent years a great deal about colloids and a great deal about catalyzers. If we can apply the principles that are fundamental in catalyzation, if we can apply in metallurgy what we know about colloids, we are certainly on the road to real success in the recovery of metals.

Just a little about rates or reactions, both chemically and metallurgically—since I am talking on a metallurgical subject, I will confine this to metallurgy. The rate of roasting by a thorough understanding of catalysis absorption and surface effects, can be increased and has been increased both in the laboratory and in the furnace 8 and 10 fold. Practically it has been increased two or three fold, and the next 8 or 10 years should see this increase more marked than it has been in the past. The increasing of the rate in metallurgical treatment means decreased cost. Decreased costs mean more return, over which the miner and the metallurgist and the Government and the state can quarrel in the matter of royalties; but it is the ambition of the metallurgist to push this to the highest degree, and here he must have the aid of this Government and of this State, and I might say the cooperation of the laymen in providing for the sufficient funds to carry out in an intelligent way the logical developments that we should expect to come.

Coming back to the progress of hydrometallurgy, we knew but little outside of the cyanide work 25 years ago. It was ridiculed when it was suggested for zinc; it was ridiculed when it was suggested as a method of treating copper ores, and in spite of that, the great Anaconda Co., the Consolidated Mining and Smelting Co., and a large number of others, went into the field with an assurance that they could work out a successful process, and they have done so. We have seen oxidized copper ores treated by the Cornelia Copper Co.; we have seen the great copper deposits in Chuquimata, Chile, operated by leaching and electrolytic methods; we have seen the installation of a new electrolytic and leaching plant in South Africa—the Katanga property; we see the Inspiration Copper Co. starting a new plant for oxidized and sulphide ores; we have seen, in the last few years, the treatment of lead ores by leaching methods in Utah, using the Hopeturn furnace roast and the salt leaching; we have seen the Bunker Hill people starting the most interesting experiments on the leaching of ores by brine and electrolytic methods.

What we will see in the next 10 years is a mere matter of speculation. However, the leaching curve is on the upward trend. Unless the people who believe in the fire or pyro-metallurgy get on their toes, unless they give more attention to the scientific development or basic development of the recovery of metals from this source, we can only predict that they will take a secondary place in metallurgy.

GOVERNMENT CONTACTS WITH MINING

(Continued from page 845)

MAP BOARD

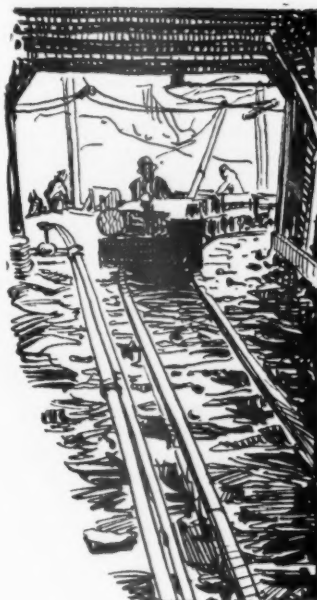
A Board of Surveys and Maps coordinates map making and surveying activities of the Government. The map-using public is invited to confer and advise at meetings of this board, its central office being in the Geological Survey.

POWER COMMISSION

Permits and licenses for development of water power for mining and other purposes are granted by the Federal Power Commission.

CO-ORDINATING AGENCIES

Operating under the Budget Bureau are Federal Co-ordinating Agencies, which as their names imply, seek uniformity of action by Government Bureaus in purchasing supplies and in other ways contributing to economy in Government expenses. A Federal specification board prescribes the specifications for articles for Government use. A board of contracts and adjustments standardizes contract forms on Government supplies and work.



COAL

PRACTICAL OPERATING MEN'S DEPARTMENT

NEWELL G. ALFORD, Editor

*Practical Operating Problems of the
Coal Mining Industry*



STORAGE BATTERY POWER FOR COAL MINE OPERATION

Installation And Operating Costs Usually Slightly Higher—Elimination Of Trolley, Feeder, Bonds And Substation Equipment Make Substantial Offset—Total Cost Explosion Prevention Through Ventilation, Rock Dusting And Storage Battery Power Estimated At Two Percent

IT has only been recently that storage battery power has been used in coal mine operation in any part except that of gathering. The element of safety obtained by the use of storage battery equipment has opened up the possibility of extending the use of the storage battery in gaseous mines to practically all underground power requirements including main haulage, gathering, cutting, drilling, and auxiliary pumping and ventilation. This would eliminate all power wires from the mine except at the charging stations where ample ventilation is easily obtained and where it is safe to use wires and open equipment.

The general impression regarding storage battery power is that it is not only more expensive in regard to first cost and operating expense but also is not as reliable as trolley power. The successful application of battery power to both haulage and cutting at the Phelps Dodge mines in New Mexico and at the Consolidation Coal Co. mines in West Virginia has shown that the above impression is not altogether true and has opened up a new field for battery power where safety is a large consideration.

A comparison will be made, using a typical mine, between the standard method of all power by wires and the battery method in which no wires are carried into the mine beyond the charging station.

By GRAHAM BRIGHT *

The use of power can be separated into three groups, as follows:

1. Main Haulage.
2. Gathering.
3. Cutting.

Pumping can be considered as part of the cutting except where bad drainage conditions exist.

In making comparisons the following items are used:

- First Cost.
- Fixed Charges.
- Maintenance.
- Power.
- Labor.
- Operating Advantage.
- Safety.

Although safety is placed last in the list it is really of paramount importance.

A typical mine selected which is of the drift type:

Thickness of coal.....	4 to 6 feet
Capacity per day.....	1,500 tons
Average days per month.....	17
Tons per year.....	306,000

In using storage batteries for mine power it is the usual practice to install 110 to 117 cells of lead battery for haulage and cutting. This battery can be charged by the usual 275-300 volt circuit

in the mine and will give an average of a little over 200 volts discharge. Standard 250 volt equipment is therefore used for main haulage and cutting.

For gathering the usual practice is to install 48 cells of lead battery and use 80 volt motors. Special M. G. sets are required for economical charging.

MAIN HAULAGE

The main haulage conditions are such that two 13-ton locomotives are required and when operating on battery each of these locomotives will require two 100-K.W.H. storage batteries. One battery will operate a main haulage locomotive for one-half of the shift and then it is replaced by a freshly charged battery.

EFFICIENCY

Under fair conditions the average voltage at the locomotive will be about 200 volts with the voltage at the substation held at 275. When using an M. G. set the average efficiency of the set is about 75 percent. This will give an average overall efficiency of 54½ percent.

Assuming that a lead battery will be used and the modified constant potential system of charging is installed, the losses from the power system to the locomotive will be made up as follows:

- Losses in M. G. set.
- Losses in resistance.
- Losses in battery.

The efficiency of each of the above

*Consulting Engineer, Pittsburgh, Pa.

under normal operation and all equipment in good condition is as follows:

Motor Generator Set.....	80 %
Resistance	87.2 %
Battery Amp. Hour efficiency.....	85 %
Battery Volt Hour efficiency.....	84.5 %
Battery Watt Hour efficiency.....	71.8 %
Total overall efficiency.....	50 %

From the above it will be seen that under the best condition 50 percent of the power is wasted when using batteries and with careless management the loss may be considerably greater.

POWER

The actual amount of power required for main haulage will be a little more with battery than with trolley power. The load factor with trolley power will be from 20 to 25 percent while with battery power it should be about 60 percent. The actual demand from the power system will be 2 to 3 times as great for the trolley as for the battery system. The actual cost of power from the average central station system in coal mining sections will be about 2.4 cents per K.W.H. for trolley power and 1.8 cents per K.W.H. for battery power. The actual cost of power for the trolley system is about 20 percent greater than for the battery system.

BATTERY

The life of a good grade of lead storage battery should be approximately 30 to 36 months for main haulage and gathering and 36 to 45 months for cutting service based on 217 days of operation per year.

FIRST COST

In estimating the total cost of installation the following items are included:

- Track.
- Trolley.
- Feeder.
- Bonding.
- Substations (complete).
- Locomotives.
- Batteries.
- Charging equipment.
- Spare parts.

With battery power, trolley, feeder, and bonding are, of course, not required.

The total cost of the above items is about \$76,000 for the trolley system and \$75,000 for the battery system. The saving in the battery system by the omission of trolley, feeder, bonding and small substation equipment is about offset by the cost of the battery and battery equipment.

FIXED CHARGES AND OPERATING EXPENSES

The fixed charges are about 50 percent greater for the battery system due to the high depreciation of the battery. The depreciation is based on the renewal price of the battery at the end of the estimated life plus \$3 per K.W.H. capacity for handling.

The upkeep and repairs are slightly less for the battery system, the labor about the same, and the cost of power considerably less.

The total cost of main haulage including fixed charges, upkeep and repairs, power and labor, is \$.08 per ton for the trolley and \$.093 per ton for the battery system.

GATHERING

Average conditions are assumed for gathering requiring eight 6-ton locomotives, the battery locomotives being equipped with 40 K.W.H. batteries.

When gathering with the trolley system the average voltage is usually under 200 and a great deal of operation is done on resistance points. For this reason the efficiency of the trolley system will average considerable less than with the storage battery system.

COST

The total cost of the equipment for the trolley system including track, trolley, feeder, bonding, substations, locomotives, and spare parts will be about \$70,000, while for the battery system the total cost will be only about \$62,000.

The fixed charges for the battery system will be about 50 percent greater than for the trolley system, the upkeep and repairs 30 percent less, the power 35 percent less, and the labor about the same.

The total cost of gathering will be \$.12 per ton for the trolley system and \$.122 per ton for the battery system.

From the above it will be seen that for gathering the battery system is cheaper to install from a cost standpoint and will cost about the same to operate as the trolley system.

CUTTING

It is assumed that short wall machines will be used, the rooms cut 22 feet wide and 6 feet deep. On account of the better voltage conditions with the battery it has been found that more rooms can be cut per shift than with the trolley system.

Seven machines will be required with trolley and six with battery power.

The power required to cut the Pittsburgh and Fairmont seams is about 50 watt hours per square foot of undercut. This would require from 75 to 80 K.W.H. per battery on the basis of six machines.

The battery system would consist of six 90-K.W.H. lead batteries mounted on self-propelled battery trucks. The gathering machine is moved about using the power truck as a locomotive. The truck will weigh about 12 tons and is not taken into the rooms. The cutting machine is connected to the truck by a double conductor cable wound on a reel and the connection is permanent. The battery truck is left at the room mouth where there is little likelihood of a roof fall.

Owing to the fact that the battery is standing still most of the time during cutting it is not subjected to continuous

vibration as in gathering and haulage. Furthermore, the battery is seldom discharged beyond its normal rate as compared with the heavy discharges in gathering and haulage. For the above reasons a greater life is expected from the battery when used in cutting service.

COST

The first cost of the cutting equipment is about \$31,000 for the trolley system and about \$76,000 for the battery system. The batteries and battery trucks are very expensive and far outweigh the cost of feed wire for the trolley system.

The fixed charges are nearly four times as great for the battery system, the upkeep and repairs about the same, the power 25 percent greater for the trolley system and the labor about 10 percent greater with the trolley system.

The total cost of operation including fixed charges, upkeep and repairs, power and labor is \$.115 per ton for the trolley system and \$.141 for the battery system.

PUMPING

Main pumps can not very well be operated from battery power but in most cases can be located in a place that is safe to use power from feed lines.

For gathering pumps located in gaseous places power can in many cases be furnished from one of the main line locomotive batteries, or from one of the power trucks when not in use for hauling or cutting. Unless this type of pumping is heavy, additional battery equipment is not necessary.

SUMMARY

Taking the mine as a whole, the total cost to equip for trolley operation will be about \$175,000 while for all battery operation it will be about \$210,000 or an increase of about 20 percent.

The total cost of operation including fixed charges and operating expenses will be \$.315 per ton for trolley operation and \$.355 per ton for battery operation or an increase of \$.04 per ton.

The amount of \$.04 per ton represents what is paid for safety and when gaseous mines exist this is a small cost to pay for safe equipment and safe operation.

The safety features of the storage battery equipment when compared with the trolley type are well recognized and would warrant a substantial increase in first cost and operating expenses.

The storage battery system has the following advantages:

Absence of trolley, wires, feeders, and bonding.

Much safer to use trailing cable due to small amount of power in battery.

Less chance for explosions or fires due to arcing on wires, cables, or rail joints.

Battery equipment can be made permissible.

Only in mines that are very gaseous is it necessary (Continued on page 889)

MECHANICAL LOADING IN COAL MINES*

Essential Factors Which Should Be Considered In Adoption Of Mechanical Loading—Underground Transportation Big Factor In Success Of Loaders—Economic Progress Made During Last Two Years Should Be Given Consideration

By S. W. FARNHAM†

THE outstanding feature in this line of work in the past few years is the fact that a few very successful operations have been worked out on a large scale; the officers and staffs in charge of this work have gone into details very thoroughly and altered and improved, in many cases, their mine equipment and mining methods, and by the exercise of persistent energy and intelligent effort, in the face of frequent difficulties and discouragements, they have attained results that are far ahead of the average loader operation.

The coal mining industry owes much to these men for the pioneering and development of mechanical loading; their investigations in transport, shooting, shearing, snubbing, cleaning, and production costs, the results of which they have given freely and frequently to the public, are of great value. Foremost among the pioneers in this work in the western districts are the Union Pacific coal properties, the Quealy properties, the Sheridan Wyoming Coal Co., and in the central west, the Union Colliery Co., of Illinois.

On the other hand, in the great majority of installations, one loader, or possibly two or three loaders have been

started in a given operation and through failure to make the proper effort to improve their transportation and work out their systems to utilize their loading machines, the loaders have not shown appreciable savings and in many cases the installation has failed.

It has been frequently stated in many meetings where loading had been discussed, that the idea of mechanical loading must first be sold not only to the operating staff but to the entire personnel of any company where installations are made. The problems involved in the successful application of this equipment are such that it requires enthusiastic and wholehearted teamwork on the part of everyone connected with the work and when difficulties arise they must be ready to exercise initiative and try new ways oftentimes of overcoming impediments.

The closest attention now is given to the question of economics—how much will a loader reduce the cost of coal in any particular situation? As we all know, the hand-loaders usually drill and load and in some places shoot the coal, timber their places and lay the track, in addition to loading the coal. In a few cases all work except loading is done by the coal company; in other cases, the loader

loads coal and does part of the other work. The shovel and its crew in replacing the handloading, does the loading only and therefore, additional labor must be employed to do the other work formerly performed by the loader.

In making comparisons between results of different types of loaders, it is customary to include men of the loader crew, and the labor required to do all the rest of the work such as tracklaying, timbering, drilling, shooting, undercutting, car switching, etc., as a loading cost. In some thick coals where very little timbering is used and the vein is level, outputs of from 18 to over 40 tons per man employed, have been obtained by the digging and loading type loaders, operating in rooms in standard room and pillar mining.

The application of these loaders generally does not involve any change in operating layout in the mine, but to obtain the best tonnages, they frequently require better trackage, larger cars, extra switches, improved transport facilities and sometimes improvements in shooting, snubbing, shearing, etc.

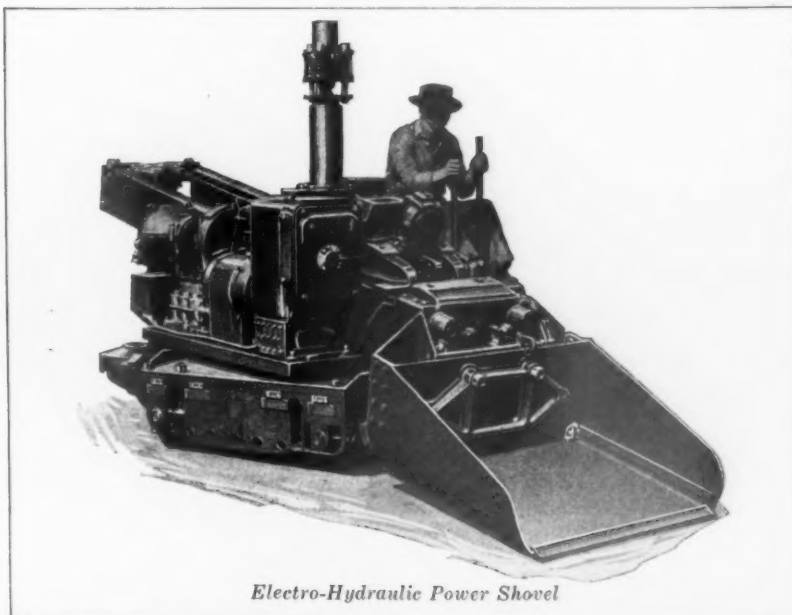
These loaders have not been developed for or operated in thin coal but are used in seams of about 5-foot thickness and upwards. They have been successfully used in pillar drawing work as well as in the wide advance work. There are types of shovels which operate both in wide and narrow work, but their capacity in narrow work is naturally considerably less than in wide.

Following close on the well established work of the mechanical shovels, are a few installations which have been recently made in the dragline scraper of high horsepower, running as high as 125 H. P. per unit. The maximum capacity of these devices runs about the same as the larger type of shovel, but they have so far required a change in the standard room and pillar system of mining which involves careful supervision to get the work properly established and maintained. This last type of mechanical loading of larger capacity is fairly new and its possibilities have not yet been fully developed. More time will have to elapse before a fair judgment can be made of the possibilities of this type of loading.

The output per man employed figured on the same basis as with shovels, is from 18 to 28 tons per man employed per shift.

The small sized scraper loader is a

* Read before the Rocky Mountain Institute, Glenn Springs, Colo., September 9, 1926.
† Mining Engineer, Goodman Manufacturing Co., 48th Street and Halstead Place, Chicago, Ill.



Electro-Hydraulic Power Shovel

type which has been on the market for about 15 years; the first installations had motors of from 7½ to 10 H.P. and present sizes are equipped with motors of from 25 to 35 H.P. A very recent installation of one of these loaders in a Central Pennsylvania mine operating in 4-ft. coal on two 75-ft. adjacent faces averaged for the first half of August, 157 tons output per shift; with a total crew of 7 men or a yield of over 22 tons per man employed. Considering the thickness of coal and the general conditions, this is considered an excellent showing.

In the early installations of cutting machines, the work was done almost entirely in the thick seams and it was not until about 10 years ago that a general development of a lower type of cutting machine for thin seams took place which resulted in the extraction of coal in thin seams at a cost which enabled them to compete with thicker ones. This recent loading work in Central Pennsylvania of 22 tons per man is an indication that ultimately loading equipment will be developed which will enable the thin vein operator to keep his cost in line with his more favored competitors operating thicker seams.

It is a generally accepted fact that the majority experience with hand-loaded conveyors at the faces, has shown that the output per all men employed can not be increased to a figure that is competitive with some other systems of loading. Only in cases where a special factor enters in can they hope to continue against such competition.

Attachments have recently been made for mechanical loading of coal on conveyors, a successful one being the McCarty duckbill which is attached to a reciprocating type of trough conveyor. This automatically feeds a pan-shaped device forward into the mass of shot coal as the conveyor oscillates and shakes the coal upon the pan and the operators assist by raking the coal down. This device was first applied in driving entry about 8 feet wide. The system used was to have a gang of four men, one of them being stationed at the discharge end of the conveyor who looked after loading cars and starting and stopping the conveyor. In addition to the conveyor, a shortwall machine was located at the face of the entry and a small blower-type, motor-driven fan was installed near the discharge end of the conveyor which delivered air through a flexible tubing to the advancing face. The remaining three men were at the face and undercut, drilled, and shot the coal and then loaded with the assistance of the duckbill attachment.

Four men working nine hours with this equipment made a record of six cuts with the machine and loaded out the coal, advancing the entry about 40 feet. The



Power Shovel in 6-Ft. Coal in an Illinois Mine

average advance is, of course, considerably less. This is an exceptional record for entry driving and one of the western coal companies has practically adopted this system for all its narrow work. It is easy to maintain the requisite amount of development work that has to be kept up in advance of the large capacity mechanical loaders following in the wide work and it is done much more cheaply than by hand methods. The McCarty duckbill is also being used in room work and for loading on long faces from the end of the shot coal pile. These applications are too new to forecast at present the tons per man that can be obtained.

An entirely different device has recently made a marked success in cheap fast entry driving. It is a Goodman entry scraper loader which has a three-drum hoist and superimposed loading chute, the entire mechanism being mounted on a self-propelling truck, which enables moving from one place to another.

One of these units of the new 35 H.P. type, advanced a 12-foot entry an average of 22 feet per shift for 12 consecutive shifts with a crew of four men in 8 hours. This average rate of advance per hour is somewhat greater than the average rate of advance per hour with the duckbill conveyor combinations.

Both applications are fairly new and the full possibilities of fast entry work have not been worked out. The conveyor arrangement requires about 40 feet of the entry work to be started by hand, in order to make room for the inclined section of the conveyor, which attains car height on about 8 percent grade and also room for driving head and other equipment; on the other hand, the entry loader

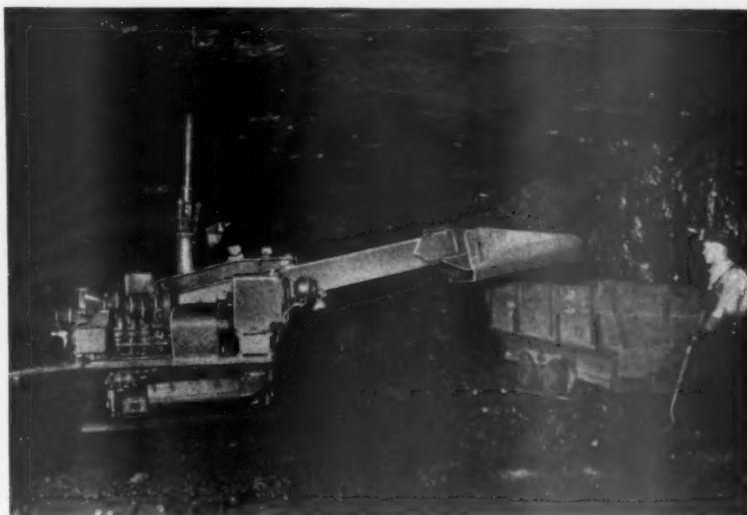
can start immediately and does not require the hand-loading.

The scraper loader is fully portable and can be moved from one place to another quickly, whereas the reciprocating conveyor with duckbill attachment, requires extension sections which have to be added to the conveyor from time to time and taking the entire mechanism down, moving and rebuilding it when about 300 feet of entry have been driven. The chief advantage of both the McCarty duckbill and the Goodman scraper loader as applied to loading lies in their ability to develop narrow work rapidly. This is more important than the cost of operation.

Underground transportation is the principal factor to be watched when installing mechanical loading. In the work of installing loading equipment over a period of several years, manufacturers have encountered more failures through lack of proper car supply on the part of the coal operators, than from any other cause and oftentimes they refuse to consider installing equipment until the mine has been properly arranged for such equipment.

At a recent mining meeting a paper was read on supplying cars to the loader and the writer mentioned shovel capacities in Illinois and Indiana for example, as varying from 125 tons to 175 tons per loader per shift.

The type of shovel with which I am most familiar, is loading from 170 tons to over 400 tons per shift under these conditions. The author of that paper had possibly centered his attention on the capacity of one particular make of loader. He also mentioned the desirability of locating between the loader and mine



Loading Out 12-Ft. From a 34-Ft. Seam in Wyoming

cars, an auxiliary device which will store coal while the cars are being changed. The most successful loading installations under my observation, where shovels are used, do not utilize any such devices but on the other hand, rely on the use of large capacity mine cars, gathering locomotives and switches or sidings placed at proper points to enable quick change of the cars to and from the shovel.

The article also mentioned where large tonnages are obtained the use of two gathering locomotives per shovel. In my experience, where records have been made, the full use of two locomotives has not been necessary. Operations have been planned where five locomotives will take care of four shovels, the locomotives being located so that one with a train of empties coming from the main siding, would travel to one shovel where the trip was about loaded and immediately start serving it. Meanwhile the locomotive that had previously been serving the shovel would haul the loaded trip to the main line locomotive parting and take a trip of empties to the next shovel to be served with a trip. Rotating this way, five locomotives can serve four shovels without delay in a systematically arranged mine.

My experience with the shovel type of loader has shown the best results are obtained by simple and heavy equipment such as gathering locomotives and cars of ample capacity and convenient switches. Many advocate the use of conveyors in the bottom of bins mounted on wheels and other mechanisms, to assist the transportation but to date, the best loading results have been made without the assistance of any such devices.

The need for the large capacity mine car is where it is loaded at the end of a stub track at the face by a shovel and has to be switched singly. Where conveyor or dragline scrapers (entry loaders) are used and the cars fed past a loading station in trains, the regular mine cars are often sufficient.

In thick veins, 5 feet and upwards, the amount of tonnage that can be obtained from the comparatively short faces in the room and pillar system of mining, usually produces sufficient tonnage per place to reduce the number of moves the shovel must make in a day to a point where its capacity is not seriously impaired. Many things have been done, particularly in the Illinois field, to assist the shovel in getting a maximum capacity; in one mine, the depth of undercut of the machine has been increased from 7½ to 9 feet. Shearing machines have been installed, shearing at each rib, thereby preventing the hanging of loose coal at the corners of the rooms, after shooting. These improvements were covered by papers read before the Cincinnati meeting of the American Mining Congress. Snubbing has also improved the capacity of the shovels. One of the most interesting results in mechanical loading has been the improvement in the lump coal not only in percentage but also size and appearance, which has also resulted in simplifying cleaning of the coal by producing the coal in larger lumps which makes the separation of slates or partings easier than if the coal were shot fine and a large number of small pieces had to be separated. Changes have been made in the arrangements for picking the slate from coal on the surface.

There is a great difference in the results obtained by the different types of shovels as to these factors; some makes of shovels have a tendency to tear and grind the coal fine and can not handle a large lump easily. On the other hand, the power shovel type by its ability to lift and handle larger lumps, without appreciably tearing, grinding or cutting the coal, do not require coal to be shot as fine for loading and thereby produce large lumps and cleaner coal has resulted than with other types of shovels.

These factors have been brought out by careful study and persistent experimentation and work on the part of certain manufacturers and operating men, whose success in mechanical loading had been very marked.

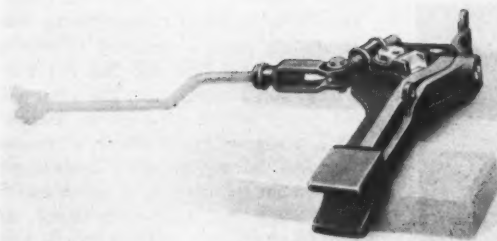
When mining coal from thinner seams, on the other hand, in order properly to reduce labor cost and to enable the operator to compete successfully with coal from thicker seams, the manager is often obliged to lengthen his faces and alter his mining method in order to get with a minimum number of moves, the necessary tonnage yield per loader per day. The case cited in Pennsylvania is a very good example, 22 tons per man in 4-foot seam of coal with a 35 H.P. entryloader.

It is, of course, recognized that physical conditions such as the roof, floor, pitch, timbering, etc., will materially affect the results obtained in any given case but today there is a disposition on the part of the operator to study more carefully these conditions than he has been accustomed to heretofore, before deciding that certain equipment or systems cannot be used.

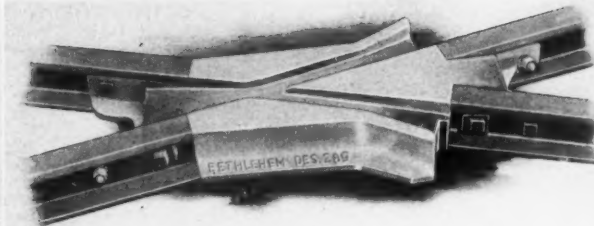
When what some consider the most successful loading installation in Illinois was started, experienced mining men claimed that the roof would not permit the use of the type of loaders selected—that the blue band at the bottom of the vein would not permit a successful cleaning of the mechanically loaded coal; that the coal would have to be shot harder and would, therefore, produce less lump. These were only a few of the reasons that are given still by many operators in neighboring mines, having similar conditions, why mechanical loaders will not work successfully.

The management in charge of the property mentioned, by careful work and persistence have gradually not only overcome the objections but have improved the situation and incidentally, made such progress in mechanical loading as to be generally recognized as a leader in loading work in that section.

In a paper read before the Institute some two years ago, I mentioned increased lump percentage, cleaner coal, etc., and predicted that they would be accomplished by mechanical loading. It is not to be inferred that all mining conditions will (Continued on page 914)



Switch Stand



Solid Manganese Frog

STEEL AND ITS USE IN COAL MINING

Steel Within The Mine Can Be Divided Into Three Groups, Track Work, Rolling Stock, And Timbers—Standardization Essential To Efficient And Economical Operation—Slightly Higher First Costs For Equipment Frequently Insure Longer Life And Consequent Economy

By GEORGE ATWELL RICHARDSON*

WHAT is the most important single essential in successful mine operation? An official of one of the larger coal mining organizations of the country answered with the two words "good track," a sentiment shared by the mining department of our own organization. He said "if you don't have good track, you can't get the coal out, and if you can't get the coal out, efficiency and speeding up on the production end is of no consequence."

The two most important considerations to bear in mind in a discussion of this kind are:

(1) Standardization within reasonable limits is most essential to efficient and economical operation. Too many fail to realize that the work being done along this line alone by the American Mining Congress and other organizations is of the greatest importance. When I use this term, I mean a degree of standardization that does not interfere with real progress.

(2) In the majority of cases willingness to pay a slightly higher price for good equipment in the first place means reduced maintenance and renewal costs which more than offset the higher first cost and slightly increased overhead carrying charges.

When I speak as a representative of Bethlehem Steel Company, I speak not in the light of sales experience alone. My statements and suggestions are based on the experience of our organization in meeting its own problems of operation. I wonder how many of those present realize the present extent of Bethlehem's coal mining activities.

There are mines in the Bethlehem organization which were operating at a time when modern coal mining methods

were unknown. For instance, there is our Rolling Mill Mine at Johnstown. This mine was first opened up in 1853 and supplied coal for the new rolling mill of the Cambria Iron Company, and has been in continuous operation ever since, with the exception of two years, when natural gas was used as a fuel.

I think it is safe to say that in the years which have intervened practically every improvement ever given consideration in coal mining practice has been tried out at one time or another. This mine has witnessed the transition from the old days when the miners went in with hand drills and picks and the haulage was performed entirely by mules, down through the days when steam locomotives, rope haulage, storage battery locomotives, and finally, the most modern types of electrically operated locomotives and mining equipment have been used. Today this mine is the largest bituminous coal mine in the country, operating through a single opening, and there are more than a hundred miles of track underground, of which nearly fifty miles are main haulage tracks. So large is the size of this mine that the problems of operation are those of operating a small railroad system, and a dispatcher is maintained whose duties are solely those of dispatching the various trips, or trains of cars, and allocating cars to the miners. This is only one of the many coal mining properties owned and operated by the Bethlehem Corporation.

When Bethlehem Steel Corporation is operating at its full, 100 percent theoretical capacity, it would require twelve million tons of coal a year, and all of the coal now used, with few exceptions, is produced entirely on the company's own properties. It can be readily seen, from the extent of the past experience

and also from the vast extent of the mining operations at the present time, that Bethlehem would naturally be interested in improvements in mining methods, and that is one of the main reasons that Bethlehem has gotten into the manufacture of mine specialties of various kinds. It is just as important for Bethlehem to have the most economical operation of its mines as it is for any outside organization.

In considering the use of steel within the mine or about the mine the subject can be divided into three main groupings. First, and most important, track work; second, rolling stock, and third, steel timbering, etc. I shall discuss the subjects by divisions, as outlined.

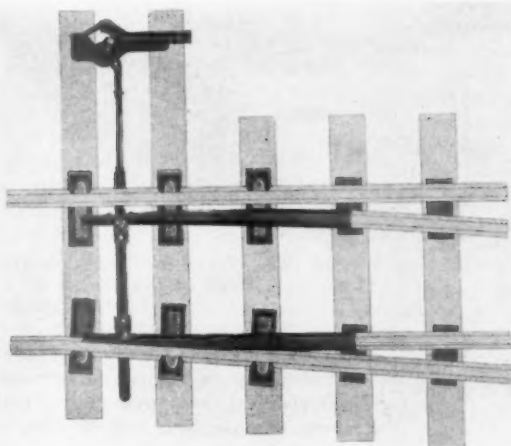
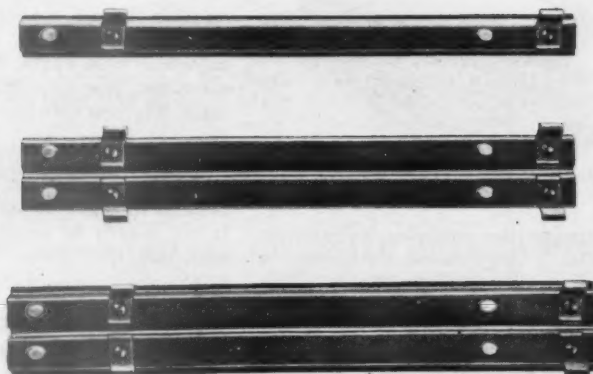
Steel mine ties have been in the field so long that it is hardly necessary for me to mention them in any great detail. There have been a number of different types designed, each having its own talking point. Naturally anything that makes for durability and simplicity is an advantage.

Originally, when steel mine ties were brought out, there was a feeling that they could be employed advantageously in every part of the mine. This might be true in some mining operations, but today, with any of the present designs of ties, I think it is safe to say that they can be used most advantageously for room work and inside entries, but can not be recommended for all parts of the mine. In our own practice, due to the increasing loads and the heavy weight of hauling equipment, we have found it necessary to maintain track in a condition which would not be possible with the use of steel mine ties. In our main haulage we find it imperative to adhere to the use of wooden ties because of the necessity for ballasting the track.

On the other hand, for room work the steel mine tie is, without question, by

* Bethlehem Steel Company.

An abstract of a talk given by the writer at the annual meeting of the West Virginia Coal Mining Institute, Bluefield, W. Va., July 18, 1926.

*Heavy Duty Switch**Types of Steel Mine Ties*

far the best thing that could be used. The advantages of the saving in headroom, the ease with which the ties can be put in and removed, the ease with which the track can be recovered, the compactness of the ties which makes it possible for the miner to carry a very considerable number into the mine and which also make it possible to store large quantities in comparatively small spaces. All of these, and many other considerations, are strong talking points in their favor.

When we come to the subject of main haulage track, however, we are approaching a problem which is becoming increasingly more difficult every year. Larger production, the use of heavy locomotives and heavy cars with large loads, makes it imperative that track be maintained in the best possible condition. In our Rolling Mill Mine, for instance, we are using 35-ton electric locomotives which, at the time of their installation at least, were the largest electric mine locomotives in the country operating on 250-volt current. These locomotives haul trips of as much as 145 cars each; the individual cars having a carrying capacity of about $1\frac{1}{2}$ tons of coal. As a result of these heavy trips and heavy locomotives, we are using 70-pound rails in our main haulage, a weight of rail which, up to comparatively recent times, was generally used on steam railroads for many of their branch line operations. Nor is this use of heavy rail confined to our Rolling Mill Mine alone, but in all of our larger mining operations, we are using rails ranging from 60 pounds to 70 pounds for main haulage.

With the heavy locomotives in use and the heavy loadings of the cars; with the increased demands of production which must be carried on as rapidly as possible, has come the need for maintaining track in the mines in a condition which is equivalent to that in which

railroad track is maintained. It is no longer economical nor practicable to maintain track-work in the careless, indifferent way which characterized mining operations of the past. In our own mines a stretch of main haulage track is leveled as well, and looks as straight and true, as many a line of steam railroad track. Heavy wooden ties are used, the track is ballasted and maintained in condition by special crews of track men who do that work and nothing else.

As I intimated in the beginning, production in the mine means nothing unless the coal can be gotten out and poor track means derailments, with not only damage to the equipment, but what is more important, serious loss of time, which means reduction in production. Therefore, anything that can be done to improve the track-work makes for economical operation on a large scale, and the first step comes in the proper maintenance of the track, which means giving it proper care, ballasting it thoroughly and maintaining it in good condition.

But this, in itself, is not sufficient. No matter how well a track may be laid and ballasted it can not give the best service unless the parts which go to make up the track are of the best for the purpose intended, and here, once more, I shall have to fall back on Bethlehem's own experience.

Bethlehem's mine business started after the war. We had designed our No. 1217 Switch Stand for narrow gauge track in the combat areas. After the war it was found that it had a number of features which made it favorable for mine use, and so it was decided to sell this stand to all mines. This decision, in turn, led to investigation which showed there was room for other specialties. The results were that we developed standards to meet varying needs, many of these being incorporated in the recommended standards of the Commit-

tee on Underground Transportation of the American Mining Congress. We realized that the equipment in use was rather flimsy and designed parts to fit in with the parallel throw switch stand, which is rugged. Along with these developments came the design of heavy duty switches, manganese frogs, and one-piece guard rails.

This was a natural development because we investigated conditions in our own mines and developed specialties in accordance with recommendations made by our own mining people; then these same specialties were tried out in our own work, and those that proved practical and worthwhile were adopted as standards. At the same time our own mining people, of their own volition, were suggesting changes and improvements which we tried out and developed.

There are several things which I would like to talk about. The first has to do with standardization. I wonder how many of you who are present fully realize the work which is being done by the American Mining Congress and other organizations along the line of standardization of mine materials. I want to go on record as stating that I, personally, am not one of those whose sole fetish is standardization. I do not believe that standardization solves every problem, nor do I believe in standardization to the extent that it interferes with progress, but I do believe, and I know from actual experience, what standardization, properly carried out, means for the users as for the manufacturer of mine products.

Just what the advantages of standardization will be to the user will depend upon the size of his own operations. In a small single mining operation some of the things in favor of standardization will not be as great as they would be in a larger and more diversified operation where several mines are included under one management. In cases of this sort,



One Piece Guard Rail

where more than one mine is operating, there is a tremendous advantage in having a standardized practice which makes it possible to use equipment interchangeably in any one of the mines. Not only does standardization mean interchangeability at the different mines, but in the case of cars it means minimizing the sizes of frogs used. Furthermore, there is a very decided advantage on the manufacturing end. Standardization means the reduction in the number of designs and types of equipment which must be manufactured. This means that material can be carried in stock for immediate delivery to better advantage and production can be carried on on a scale which makes for lower costs. It has been my experience that too often the user thinks that these things really react more to the benefit of the manufacturer than they do to himself, which, however, is not actually the case. They do help the manufacturer in many ways, but they help the user even more.

In speaking of standardization, I have an old stock example which I like to mention because it is rather spectacular, possibly, in its nature and at the same time comes home so directly. In recent years, as most of you know, cast iron wheels have been largely replaced by rolled steel wheels on steam railroads, electric railroads and in similar work, and here, in the case of this specialty, we have an excellent example of what can be accomplished by standardization, and what happens where standardization is not resorted to.

The steam railroads of the country have adopted 10 standard types of wheels. On the other hand, the electric railway companies, not wholly through their own fault but partly because of demands of equipment already in use, have not standardized to the same extent. A few years ago, a committee of the Central Electric Railway Association, investigating this subject found that between 360 and 400 different types of wheels were being specified, and one writer went so far as to state that nearly 2,000 types were in use. Even if we accept the smaller number, this is far more than is necessary for good practice.

Now just what does this mean? Almost any variation in size and type of wheel requires a complete set of dies and rolls. This set of dies and rolls

will weigh in the neighborhood of 20 tons, or 40,000 pounds. Depending on whether or not old equipment can be utilized and converted, the set will cost anywhere from \$1,200.00 to \$4,000.00 to make up. Not only this, but to change these dies and rolls takes up anywhere from 10 percent to 15 percent of the time of a day's run in a plant unit representing an investment of in the neighborhood of eight to ten million dollars. It can readily be seen, from these figures, that it is going to cost money to fill the small, isolated orders which come in for certain types of wheels. It would be impossible for the individuals to pay the full cost of producing a few wheels and hence these charges must be distributed in some degree in a general way. Furthermore, we can not afford to

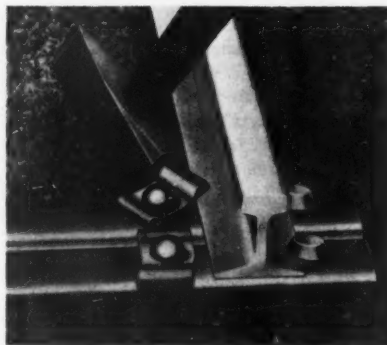


Steel Sprag with Hilt

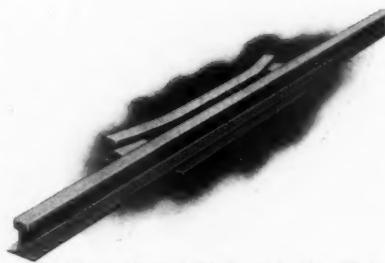
change dies and rolls in the midst of big runs simply to take care of the small orders, and that means that the customer is penalized by very considerable delays in obtaining his material, as well as in higher prices.

But these are not all of the disadvantages. It stands to reason that we can not afford to stock wheels in large quantities which are very seldom, and perhaps, never called for. On the other hand, we can and do stock the standard sizes commonly used, which sizes are limited in number.

This is just one example of the value of standardization. It is a condition which, in more or less serious form, is met with in every part of the steel business. In our Tool Steel Mills we are confronted with the problem of changing rolls, which takes one and one-half hours to do, simply to make up small, special orders which have to be taken care of. In our car shops minor changes in design, oftentimes hardly worth while, necessitates the making up of new and special dies and the consequent retarding of production. And so it goes all



Method of Clipping Ties to Rail



One Piece Guard Rail with the Main Rail in Position

along the line, and that is why I emphatically urge the advantages of standardization, to a reasonable degree, to every one of you present. It means money in your own pockets first, last and all the time.

The second thing which comes up is the question of price. One of the greatest difficulties that the manufacturer of products of any kind has to contend with is that of first cost. Too often the buyer of any kind of a product considers too seriously the first cost rather than looking ahead and seeing what a slight increase might be to him in the way of increased service and increased profits. In our own mines we have long since realized the value of using the very best in the way of equipment. We use extra heavy parts in all of our mine track-work, and the best grades of steel for other purposes about the mine.

A large part of the cost of track-work comes in the installation. Maintenance, of course, is an item of expense, but it is nowhere as great as that of actual installation. Now it is perfectly possible to buy cheap frogs and switches, etc., and the first cost will make the operation inexpensive. But if that installation has to be replaced two or three, or even more times, in the same period that a slightly more expensive lot of equipment would last without any replacement whatsoever, it stands to reason that the slightly increased cost is more than covered and there is a direct profit. So that has been the keynote of all our activities; the education of the users to the fact that there is a very decided advantage to their own pocket-books in the use of heavy duty equipment, and equipment designed especially for the purpose rather than the use of anything that happens to meet the convenience of the occasion.

It has been a hard, up-hill battle and there are many places where, even today, the advantages of the use of equipment of this kind are not yet fully realized. And yet, in the bigger operations, this idea is being sold and in the newest installations equipment for heavy duty is being put in. One of the most recent examples of this is the new Warden Mine of the Pittsburgh Coal Company.

I might add one statement made by

one of our own mining officials to the effect that good clearance, both as regards height and width is as needful as good track. Where there is not ample clearance the necessity for dodging slows up operations and there is not the proper degree of safety because signals can not be observed readily.

The second part of my talk has to do with rolling stock. Here, very naturally, there is a wide diversity both as regards design and size of equipment used due to the varying conditions which exist in the different mines. A car that can be used successfully and economically in high coal may not be adapted at all to use in low coal and vice versa. Nevertheless, here again, there is plenty of opportunity for an approach towards standardization with its advantages to the ultimate consumer.

Our own people believe that narrow gauge track is out of date. A 44-inch gauge gives more stability on a wide mine car, and this is the right car for mechanical loading; three to five-ton capacity is needed.

The standard car which we are trying to adopt tends to be wide and low. A low car increases efficiency 20 percent on account of less lift, and keeps on the track better due to the fact that the weight is closer to the track. It is possible to drop cars by raising wheels 2 or 3 inches. In our Rolling Mill Mine we are now using 2-ton cars, as a result of which we gain nearly 60 tons per trip, with an average of 120 mine cars per trip. As this is low seam coal, we are necessarily restricted as regards the size of cars which can be used advantageously.

Within a very recent time, there has been a marked and growing tendency towards the use of all-steel and composite mine cars. By the term "all-steel" we, of course, mean a car built entirely of steel. The term "Composite" is generally applied to cars built of steel with wooden bottoms. This latter type is the most popular one due to the shock resisting ability of wood and the fact that the bottom of the car is less subject to corrosion due to acids and Glauber's Salts. Steel bottoms wear out twice as fast as wood bottoms. Furthermore, the thicker bottoms obtainable where wood is used give a better base for the rigging. Thicker steel could, of course, be used, but it is too rigid. The running gear would not be able to take up deviations in track.

While we have indicated steel as a recent development, it is by no means a new proposition; in fact, Bethlehem has had composite steel cars in service 15 years, and they have proved satisfactory.

The tendency of present construction is towards the use of copper bearing steels in sides and end sheets and other

parts of thin nature which are liable to corrosion which would destroy them. Copper is particularly valuable in sheets of a thickness of from 3/16 to 1/4-inch. While we have no comparative record on the life of mine cars built this way, a report was gotten out some time ago on the life of a railroad car. This report indicates that .20 to .30 copper content steel has about double the endurance of sheets made of the ordinary grades.

With a reasonable degree of standardization in mine car design it would be possible to build mine cars on a much larger scale, and hence, to better advantage in every way. Furthermore, it would become possible to stock cars and they would be available for quick delivery, which is not always the case at the present time.

The third division of my talk has to do with steel mine timbers. In the case of mine timbers I think the main thing that is necessary to stress is the fact that, once more, standardization is a thing much to be desired.

Steel mine timbers have their uses and in their place they are valuable. The use of steel mine timbering is bound to grow each year as timber grows more and more scarce. The important thing is that where steel is used, it be properly used, because steel mine timbers improperly placed will give trouble. Each end must be tied in. Steel tends to buckle all the way through just by starting the swinging of two sets. Where there are anything over 10 sets of timber of four feet to hold, our own people recommend the use of steel. One of our officials states that he has seen 32 sets of timber buckle because of improper tying. The tying must be done very tightly.

A further advantage of steel mine timbers is the increased life. Twelve by twelve timber lasts about 15 years under good conditions and it is not possible to retimber because the roof presses down too much.

In conclusion, I want to emphasize just once more the fact that there are very decided advantages to the consumer in adopting, to a large extent, standardized equipment and practices and at the same time being willing to pay slightly higher first costs in order to secure longer life and consequent economy in operation.

STORAGE BATTERY POWER

(Continued on page 882)

to install battery equipment for main haulage. In the majority of gaseous mines very safe operation can be obtained by installing batteries for cutting and gathering only and this can be obtained for an increase of less than \$.03 per ton. The safety obtained is worth far more than this amount.

A gaseous mine that is properly ven-

tilated, thoroughly rock dusted and equipped with approved battery locomotives for gathering, battery trucks for approved cutting machines, and closed lights, is made as safe as is humanly possible and the likelihood of even a slight local explosion is extremely remote. The cost of making a gaseous mine safe is about 2 percent of the total cost of the coal and this is a remarkably low cost to obtain real safety.

OIL SHALE HEARING HELD

MINING men interested in the development of the oil shale industry in the U. S. appeared before Secretary of Interior Work and other officials on December 1 to urge a change in the regulations as to what shall constitute a "discovery" of an oil shale deposit. The main objection to the present regulations by those interested in securing locations is to the requirement that discovery will only be recognized where there is an exposure on the surface of shale having an oil content of not less than 15 gallons per ton.

Much of the discussion centered around the Green River formation in Colorado, Wyoming, and Utah, as an example. R. D. Hawley, representing various oil shale companies, stated that this formation is one massive "ore" deposit, any part of which will, upon distillation, produce oil in varying quantities, and that a location on any part of this deposit should constitute a discovery.

The department was asked to accept and announce a rule concerning discovery, in substance as follows:

"A legally sufficient discovery to form the basis of a location of an oil shale placer claim appears where it is shown that oil-yielding shale is physically exposed or disclosed upon the claim, and the evidence is of such a character that a person of ordinary prudence would be justified in the further expenditure of his labor and means, with a reasonable prospect of success, in developing a valuable mine."

"Such evidence may be to the effect, or of such character as to show that the shale so exposed is a part or portion of a formation or deposit which is known through geological evidence, exploration and/or development at other points to carry oil shale of value."

The oil shale men were supported in their contention by Senator Kendrick and Representative Winter, of Wyoming, and Representative Taylor, of Colorado. Representative Taylor declared these deposits constituted one of the nation's greatest assets, and should not be developed on a leasehold plan. Senator Kendrick expressed the opinion that it was all a question of good faith—if it was worth the time and money of a prudent man to undertake the development of a shale claim, there must be some prospect of success and the Government should be willing to take the chance with the miner.

PERMISSIBLE MINING EQUIPMENT

Complete List Of Permissible Mining Equipment, Rescue Apparatus And Gas Masks Was Issued By Bureau In 1925 And Appeared In December Issue Mining Congress Journal—Following List Includes All Equipment Tested And Approved Up To and Including November 18, 1926

A LIST of permissible mining equipment, rescue apparatus and gas masks tested and approved by the Bureau of Mines prior to November 18, 1926, is included in Bureau of Mines Information Circular No. 6012, dated August, 1926, and a supplemental sheet, dated November 18, 1926, prepared by

the Bureau of Mines Experiment Station at Pittsburgh, Pa. The list covers electric air compressors, coal drills, mining machines, loading machines, conveyors, mine pumps, room hoists, switches, electric cap lamps, flame safety lamps, electric hand and trip lamps, flash lamps, methane indicators and detectors, blasting units, storage battery locomotives,

power trucks, self contained oxygen breathing apparatus and gas masks.

Manufacturers of equipment tested and approved by the Bureau of Mines, and included in the list, are permitted to mark their equipment with a seal showing approval by the Bureau of Mines. The following list includes all equipment approved up to November 18, 1926:

PERMISSIBLE MINING MACHINES, COAL DRILLS, ETC.

Approved Under Schedules 2, 2A, and 2B

Air Compressors

1. Type WK-26 compressor—30 horsepower motor, 250-500 volts, D. C. Approvals No. 117 and 117A, issued to Sullivan Machinery Co., March 12, 1925.
2. Type WK-39 self-propelled compressor—30 horsepower motor, 250-500 volts, D. C. Approvals No. 120 and 120A, issued to Sullivan Machinery Co., July 28, 1925.
3. Type CP-26D and CP-26N compressor—25 horsepower motor, 500 volts, D. C. Approval No. 128A issued to General Electric Co., July 16, 1926.

Loading Machines

1. Type 43-A shortwall loader—Jeffrey 50 horsepower motor, 250-500 volts, D. C. Approvals No. 122 and 122A, issued to the Jeffrey Mfg. Co., January 8, 1926.
2. Type 44-B conveyor loader—Jeffrey 50 horsepower motor, 250-500 volts, D. C. Approvals No. 123 and 123A, issued to the Jeffrey Mfg. Co., January 15, 1926.
3. Belt type conveyor—South Fork Foundry & Machine Co. 5 horsepower motor, 250 volts, D. C. Approval No. 126, issued to Bird Coal Co., June 26, 1926.
4. No. 4 and Special No. 3 shovel type loaders—General Electric Co. 30 horsepower motor, 250 volts, D. C. Approval No. 127 issued to Myers-Whaley Co., July 16, 1926.
5. Steel chain flight conveyor—South Fork Foundry & Machine Co. 5 horsepower motor, 250 volts, D. C. Approval No. 129 issued to Bird Coal Co., July 21, 1926.

Coal Drills

1. Type 2BF drill—1 horsepower motor, 80-110-250 volts, D. C. Approvals No. 109 and 109A, issued to Chicago Pneumatic Tool Co., September 19, 1922.
2. Type CD drill— $\frac{3}{4}$ horsepower motor, 110-230 volts, D. C. Approvals No. 110 and 110A, issued to Martin-Hardsocg Co., September 16, 1922.
3. Type A-5 drill—3 horsepower motor, 110-250 volts, D. C. Approvals No. 119 and 119A, issued to Jeffrey Mfg. Co., April 15, 1925.

Mining Machines

1. Type CE-7 Ironclad shortwall mining machine—30 horsepower motor, 250-500 volts, D. C. Approvals No. 100 and 100A, issued to Sullivan Machinery Co., September 30 and October 20, 1914, respectively.
2. Types 12-CC and 12-EC shortwall mining machines—35 horsepower motor, 210-500 volts, D. C. Approvals No. 101 and 101A, issued to Goodman Mfg. Co., May 20, 1916.
3. Type 35-B shortwall mining machine—35 horsepower motor, 250-500 volts, D. C. Approvals 103 and 103A, issued to the Jeffrey Mfg. Co., November 2, 1917.
4. Type CE-7 Ironclad shortwall mining machines—30 horsepower motor, 220-440 volts, A. C. Approvals 104 and 104A, issued to Sullivan Machinery Co., January 16, 1918.
5. Types 12-CJ and 12-EJ shortwall mining machines—50 horsepower motor, 210-500 volts, D. C. Approvals No. 105 and 105A, issued to Goodman Mfg. Co., June 21, 1920.
6. Types 112-CC and 112-EC shortwall mining machines—50 horsepower motor, 210-500 volts, D. C. Approvals No. 106 and 106A, issued to Goodman Mfg. Co., February 9, 1922.
7. Types 12-CC and 12-EC shortwall mining machines, 35 horsepower motor, 210-500 volts, D. C. Approvals No. 107 and 107A, issued to Goodman Mfg. Co., February 9, 1922.
8. Types 112-CJ and 112-EJ shortwall mining machines, 35 horsepower motor, 210-500 volts, D. C. Approvals No. 108-108A, issued to Goodman Mfg. Co., February 9, 1922.
9. Type 35-BB shortwall mining machines—50

horsepower motor, 250-500 volts, D. C. Approvals No. 111 and 111A, issued to Jeffrey Mfg. Co., October 16, 1922.

10. Type 29-C arcwall mining machine—50 horsepower motor, 250-500 volts, D. C. Approvals No. 112 and 112A, issued to Jeffrey Mfg. Co., March 13, 1924.

11. Types 212-EJ and 212-CJ shortwall mining machines—50 horsepower motor, 210-500 volts, D. C. Approvals No. 113 and 113A, issued to Goodman Mfg. Co., November 4, 1924.

12. Types 112-CK3 and 112-EK3 shortwall mining machines—35 horsepower motor, 220-440 volts, A. C. Approvals No. 114 and 114A, issued to Goodman Mfg. Co., February 7, 1925.

13. Types 112-CL3 and 112-EL3 shortwall mining machines—50 horsepower motor, 220-440 volts, A. C. Approvals No. 115 and 115A, issued to Goodman Mfg. Co., February 7, 1925.

14. Type 124-EJ slabbing machine—50 horsepower motor, 210-500 volts, D. C. Approvals No. 118 and 118A, issued to Goodman Mfg. Co., March 12, 1925.

15. Type 30-A shearing-drilling machine—50 horsepower motor, 250-500 volts, D. C. Approvals No. 125 and 125A, issued April 26, 1926, to the Jeffrey Mfg. Co.

Room Hoists

1. Oaks safety room hoist—5 horsepower motor, 250 volts, D. C. Approval No. 116, issued to South Fork Foundry & Machine Co., February 13, 1925.

Rock Dusting Machines

1. M. S. A. rock dust distributor—Westinghouse 5 horsepower motor, 250 volts, D. C. Approval No. 130, issued to Mine Safety Appliances Co., November 5, 1926.

Mine Pumps

1. Dravo-Doyle mine pump; Type Austin 5 x 6—5 horsepower General Electric motor and control, 500 volts, D. C. Approval No. 121-A, issued to Dravo-Doyle Co., October 1, 1925.
2. Dravo-Doyle mine pump; Type Austin 5 x 6—5 horsepower Westinghouse motor and control, 250-500 volts, D. C. Approvals No. 124 and 124A, issued to Dravo-Doyle Co., April 14, 1926.

PERMISSIBLE ELECTRIC SWITCHES AND JUNCTION BOXES

Approved Under Schedule 4A

1. Two pole fused switch enclosed—100 amperes, 500 volts, D. C. Approval No. 400A, issued to Ohio Brass Co., August 5, 1925.

PERMISSIBLE ELECTRIC CAP LAMPS FOR MINERS

Approved Under Schedule 6A

1. Edison Model "C" lamp. Approval No. 10, issued to Edison Storage Battery Co., February 24, 1915.
2. Wico lamp. Approval No. 14, issued to Witherbee Igniter Co., June 10, 1916.
3. Wheat lamp. Approval No. 17, issued to Koehler Mfg. Co., Inc., September 23, 1919.
4. Edison Model "E" lamp. Approval No. 18, issued to Edison Storage Battery Co., March 28, 1923.
5. RM-6 f. d. CEAG lamp. Approval No. 19, issued to Concordia Electric Co., August 2, 1923.
6. Super-Wheat lamp. Approval No. 20, issued to Koehler Mfg. Co., Inc., April 27, 1926.
7. RM-7 CEAG lamp. Approval No. 21, issued to Concordia Electric Co., June 18, 1926.

PERMISSIBLE FLAME SAFETY LAMPS

Approved Under Schedules 7, 7A and 7B

1. Koehler steel frame lamp—flat wick. Approval No. 201, issued to Koehler Mfg. Co., Inc., August 21, 1915.

2. Koehler steel frame lamp—round wick. Approval No. 201A, issued to Koehler Mfg. Co., Inc., July 29, 1918.

3. Koehler aluminum frame lamp—flat wick. Approval No. 203, issued to Koehler Mfg. Co., Inc., February 7, 1919.

4. Koehler aluminum frame lamp—round wick. Approval No. 203A, issued to Koehler Mfg. Co., Inc., February 7, 1919.

5. Wolf brass frame lamp—round wick. Approval No. 204, issued to Wolf Safety Lamp Co. of America, Inc., July 18, 1921.

6. Wolf aluminum frame lamp—round wick. Approval No. 205, issued to Wolf Safety Lamp Co. of America, Inc., April 24, 1924.

7. Wolf aluminum frame lamp—flat wick. Approval No. 206, issued to Wolf Safety Lamp Co. of America, Inc., April 24, 1924.

PERMISSIBLE METHANE INDICATORS AND DETECTORS

Approved Under Schedules 7B and 8A

Methane Indicators

1. Burrell indicator. Approval No. 800, issued to Mine Safety Appliances Co., March 10, 1922.

Methane Detectors

1. Wolf flame type detector. Approval No. 207, issued to Wolf Safety Lamp Co. of America, Inc., November 21, 1924.

PERMISSIBLE ELECTRIC HAND AND TRIP LAMPS

Approved Under Schedule 10A

1. Type RMC-RMCT CEAG hand and trip lamp. Approval No. 1000, issued to Concordia Electric Co., May 25, 1922.
2. Model "E" inspection lamp. Approval No. 1001, issued to Mine Safety Appliances Co., July 25, 1925.

PERMISSIBLE ELECTRIC FLASH LAMPS

Approved Under Schedule 11

1. Eveready, safety type, flash lamp. Approval No. 601 issued to National Carbon Co., Inc., October 22, 1924.

PERMISSIBLE SINGLE-SHOT BLASTING UNITS

Approved Under Schedule 12

1. Attachment for Edison M-8 mine lamp battery. Approval No. 1200, issued to Mine Safety Appliances Co., May 24, 1920.
2. Davis No. 0 Magneto type blaster. Approval No. 1201, issued to Davis Instrument Mfg. Co., Inc., March 15, 1921.
3. Du Pont pocket magneto type blaster. Approval No. 1202, issued to E. I. Du Pont de Nemours & Co., August 15, 1924.
4. Davis No. 00 magneto type blaster. Approval No. 1203, issued to Davis Instrument Mfg. Co., Inc., October 17, 1924.
5. Attachment for Concordia type RM-6 f. d. mine lamp battery. Approval No. 1204, issued to the Concordia Electric Co., March 2, 1925.
6. Attachment for Edison Model "E" lamp battery. Approval No. 1205, issued to the Mine Safety Appliances Co., April 23, 1925.
7. Eveready dry cell blaster. Approval No. 1206, issued to National Carbon Co., Inc., August 20, 1925.
8. Davis No. 000 magneto type blaster. Approval No. 1207, issued to Davis Instrument Mfg. Co., Inc., November 18, 1926.

PERMISSIBLE STORAGE BATTERY LOCOMOTIVES AND POWER TRUCKS

Approved Under Schedule 15

Gathering Locomotives

1. Whitcomb E. S. B. flame-proof locomotive. Approval No. 1500, issued to Geo. D. Whitcomb Co., March 14, 1921.
2. Jeffrey type B. D. M. class 40 locomotive. Approval No. 1501, issued to the Jeffrey Mfg. Co., October 11, 1921.
3. Mancha flame-proof "Hercules" locomotive. Approval No. 1502, issued to the Mancha Storage Battery Locomotive Co., November 13, 1922.
4. Ironton type W. O. G. locomotive. Approval No. 1503, issued to the Ironton Engine Co., March 24, 1923.
5. Goodman articulated type locomotive. Approval No. 1504, issued to the Goodman Mfg. Co., July 10, 1923.
6. Mancha Hercules A and AX locomotives. Approval No. 1505, issued to the Mancha Storage Battery Locomotive Co., April 5, 1924.
7. Jeffrey type B. D. M. class 25 locomotive. Approval No. 1507, reissued to the Jeffrey Mfg. Co., August 20, 1925.
8. Goodman type "10-30" locomotive. Approval No. 1508, issued to the Goodman Mfg. Co., March 21, 1925.
9. Goodman type "8-30" locomotive. Approval No. 1509, issued to the Goodman Mfg. Co., September 25, 1925.
10. Mancha Standard A and AX locomotives. Approval No. 1511, issued to Mancha Storage Battery Locomotive Co., November 10, 1925.
11. Westinghouse type Baldwin-Westinghouse locomotive. Approval No. 1512, issued to Westinghouse Electric & Manufacturing Co., November 11, 1925.
12. General Electric type LSBE-2c6-C9 locomotive. Approval No. 1513, issued to General Electric Co., February 25, 1926.

Main Line Haulage Locomotives

1. Jeffrey type B. D. M., class 30, main-line haulage locomotive. Approval No. 1510, issued to Jeffrey Mfg. Co., October 12, 1925.

Power Trucks

1. Mancha "power truck." Approval No. 1506, issued to Mancha Storage Battery Locomotive Co., May 5, 1924.

PERMISSIBLE SELF-CONTAINED OXYGEN BREATHING APPARATUS AND GAS MASKS

Approved Under Schedules 13 and 14A

Oxygen Breathing Apparatus

1. Gibbs Mine Rescue Breathing Apparatus. Approval No. 1300, issued to Mine Safety Appliances Co., January 15, 1920.
2. Paul Mine Rescue Breathing Apparatus. Approval No. 1301, issued to American Atmos. Corp., January 15, 1920.
3. Fleuss-Davis Proto Apparatus. Approval No. 1302, issued to Siebe, Gorman and Co., Ltd., February 7, 1924.
4. McCaa Mine Rescue Breathing Apparatus. Approval No. 1303, issued to Mine Safety Appliances Co., August 31, 1925.

Gas Masks

1. Burrell Ammonia Gas Mask. Approval No. 1401, issued to Mine Safety Appliances Co., April 10, 1920.
2. M. S. A. Self Rescuer. Approval No. 1402, issued to Mine Safety Appliances Co., March 6, 1924.
3. All-Service Gas Mask. Approval No. 1403, issued to Mine Safety Appliances Co., July 1, 1925.
4. G. M. D. Ammonia Gas Mask. Approval No. 1404, issued to Mine Safety Appliances Co., March 10, 1926.

The Mississippi State Development Board has issued a map of the State showing the location of its mineral resources and railroads. The map was prepared by Dr. Henry Mace Payne, consulting engineer of the American Mining Congress, based upon field work in connection with his survey of Southern mineral resources. The map is being distributed by L. J. Folse, of Jackson, Miss., for the board, of which he is general manager. It is being sent to schools and other public institutions of the State. The presence of minerals by counties is shown by symbols.

MEXICAN MINING LAWS

Laws Governing American Controlled Mexican Mines Not Easy Of Interpretation—Provision Requiring Registration Of Claims Should Be Complied With At Once

By F. H. NEWELL *

YES, we have translated the Mexican mining laws and regulations of mineral industries, but can anyone interpret them?" This is the general question. It is not difficult to translate the Spanish words into English terms but when this is done what does it all mean? Quien sabe? Guess for yourself! As a result the wildest guesses have been made; some almost hysterical, most malevolent designs have been attributed to Mexican statesmen. The man who can explain, expound or interpret the laws and regulations and then apply them to each particular case is yet to be found.

Meantime, many American owners of mines in Mexico, especially the smaller ones, are justifiably uneasy. Others, unaware of impending penalty, are sleeping on their rights. If the matter comes to their attention they calmly assume that all-powerful and paternal Uncle Sam will look out for them. Why worry? Between frantic appeals and demands on the one hand and calm indifference on the other, there is a sensible medium course; that of businesslike study or research into the facts, followed by prompt action based on these facts. To handle the matter intelligently, a sane background must be built up, namely, the attempt of the Mexican Congress and executive to work out the ideas of "Mexico for the Mexicans."

This attempt is expressed in article 27 of the Mexican Constitution of 1917; everyone who is interested in Mexican affairs should read this article. It is extreme in its declarations and yet it is perhaps justified by the fact that it was drawn to rectify extreme conditions.

Although article 27 has been on the statute books for nearly 10 years it has not yet been put fully into effect (and possibly never will be) but the present administration is endeavoring to carry out some of the provisions in spite of innumerable protests not only from the citizens of Mexico but from those of other countries, particularly of the United States. The law contains a warning, however, to the effect that aliens have no greater privileges than natives and that an appeal to a foreign government may be prejudicial or even work forfeiture.

The law of mineral industries of Mexico which took effect August 1, 1926, states at the outset that "the nation has direct dominion over all natural mineral

substances," etc. Also that the "direct dominion of the nation is inalienable and imprescriptible and only by concession of the federal executive power" can operations be carried on in the mineral industry. In article 24 it is provided that only Mexicans and civil or commercial Mexican companies shall have the right to obtain concessions. Later it is provided that the concessions shall be for 30 years, also that in the mineral industries the higher personnel shall consist of from 50 to 90 percent of Mexicans and of the working men 90 percent shall be natives. A minimum of production is required for each mine.

For the mines for which title has already passed there shall not be required new concessions but these must be registered within a year from August 1, 1926, and made subject to the new requirements. A public register is established in the Department of Industry, Commerce and Labor and special books are provided in the public register of commerce in each state.

Forfeiture of mining concessions may result from not proving annually that the minimum production has been obtained or for transferring a concession without the approval of the Secretary of Industry, Commerce and Labor or other sufficient reasons.

The attempt made in these laws and regulations to secure complete registration of all mining claims is to be commended; also the effort to require the people who claim rights to develop the mineral wealth of Mexico to proceed with the work and not hold out of use the valuable mineral deposits. The effort is made to prevent the "dog in the manger" attitude or monopoly of mineral deposits such as has operated so badly in many other countries.

The danger to American owners is that they will be unaware or indifferent as to the need of prompt action in registering their claims and performing the operations required by law. As a rule, these requirements are not oppressive or unfair if it is assumed that the mineral wealth belongs to the people of Mexico and that they are permitting other persons to obtain these valuable minerals on condition of payment of relatively insignificant amounts. It is all in the way in which these requirements are looked upon, but—whether onerous or not—they must be complied with, the man who sleeps on his rights or expects that some other person will attend to them is likely to be deeply disappointed or defrauded according to his ideas.

* The Research Service, Washington, D. C.

BUREAU OF MINES ACTIVITIES

A Summary Of The Activities Of The Bureau Since Transfer To Commerce Department

CONTINUATION of the educational campaign designed to decrease the death and injury rates among the million miners of the United States was the predominant feature of the activities of the Federal Bureau of Mines during the fiscal year 1926, the first year in which the Bureau functioned under the Department of Commerce. Substantial progress was achieved in the movement for the rock-dusting of bituminous coal mines as a preventive of explosions, a great number of the larger mines having adopted this safety measure.

The Bureau continued its intensive efforts in the teaching of safety to the miner. During the year 28,041 miners were trained in first-aid and mine rescue methods, an increase of 3,866 over the number trained in the previous year. Since the beginning of this work, the Bureau has instructed nearly 200,000 miners, and has also given safety instruction to many city firemen, policemen, boy scouts, scholars in public schools, and the wives and children of the miners. During the past year this training was conducted in 33 states and in Alaska.

Mine-safety studies were continued in the experimental coal mine at Bruceton, Pa., the only coal mine in the world devoted exclusively to Government safety research. Tremendous explosions of coal-dust are frequently staged at this mine and vivid demonstrations of the efficiency of rock-dust for limiting or preventing such explosions are given. Cooperation was continued with the Mines Safety Research Board of the British Mines Department at the Bureau's experiment station at Pittsburgh and in the Eskmeals experimental gallery in England. A new type of gas mask, devised to afford protection in air against all gases, vapors and smokes was developed. Studies recently completed by engineers of the Pittsburgh experiment station have demonstrated that voice signals can be transmitted in and out of a mine, through more than 400 feet of strata, by the use of dry cells as a source of electrical energy and of modified telephone parts as receiving and sending apparatus. The development of practical means of communication between miners entombed after mine fires and explosions and rescue parties on the surface would naturally be of the greatest aid in the conduct of mine rescue operations.

A carbon monoxide recorder developed at the Pittsburgh station has given excellent service in a number of fields.

This delicate instrument gives warning of the presence of this deadly gas in tunnel atmospheres of four parts in ten thousand parts of air, and indicates much lower concentrations. The recorder should prove of value in the maintenance of safe atmospheric conditions in the vehicular tunnels of the country now congested with automobile traffic. A new method of measuring the rate of detonation or speed of an explosive has been developed by the Bureau, in which a photograph of a detonating column of explosive is taken on a rapidly moving film.

The Bureau's safety campaign has been extended to the legion of workers in the petroleum and natural gas industries, and great interest has been aroused among these employees. First-aid teams, trained to a high degree of efficiency in safety measures, have been organized at numerous points in the oil producing and refining districts.

Actual production of shale oil has begun at the experimental oil-shale plant established near Rulison, Colo., as the result of special Congressional legislation. American-type and Scottish-type retorts are being operated for purposes of comparison. It is hoped that the operation of this experimental plant may be an important step in the development of an American shale oil industry which at some future date may attain tremendous proportions.

Helium Production Plant No. 1, near Fort Worth, Texas, was transferred during the year from the Navy Department to the jurisdiction of the Bureau of Mines. The Bureau is conducting an intensive search for sources of helium, so vital in the operation of monster dirigibles of the Los Angeles type.

The Bureau continued its study of the causes of mine fires and explosions, furnishing reports to the mine operators following investigations of disasters at their mines. Investigations on the use of electrical equipment in mines and the use of flame safety-lamps and gas-detecting apparatus were continued. The Bureau's "permissible" list now covers virtually every line of activity for which equipment is used in underground coal mining. Manufacturers are giving more attention to the designing of permissible mining machinery, and the Bureau looks forward to the time when operators will be able to equip their mines completely with apparatus that has been tested and listed as permissible.

The Safety Extension Service was established during the year. Its chief

functions are to bring before the industry the Bureau's recommendations on rock-dusting bituminous coal mines, the use of closed lights, advanced mine rescue training, mine safety organization, and the purpose of the Holmes Safety Association; also to conduct field demonstrations of the explosibility of coal dust and the use of rock-dust as a preventive of mine explosions. The Joseph A. Holmes Safety Association, named in honor of the first Director of the Bureau of Mines, has among its members thousands of miners who are making special efforts to advance safety in mining. During the year, 30 new chapters were organized—13 in Pennsylvania, 11 in Alabama, two in Wyoming, two in Kansas, one in Missouri, and one in Oklahoma.

In many places metal mine workers are seriously menaced by harmful dusts and lack of ventilation. The Bureau is studying ventilation conditions in various metal mines throughout the country.

Chemists at the Pittsburgh experiment station have developed a new respirator which is believed to be superior to other devices as a means of protecting wearers from injurious dusts encountered in mining and other industries. Studies conducted in cooperation with the United States Public Health Service and the American Society of Heating and Ventilating Engineers are affording information relative to temperatures and air-movement conditions which afford the best safety and efficiency conditions in mines and factories. Sanitary surveys of mining towns in various parts of the country have been made by Public Health Service officials attached to the staff of the Bureau of Mines. A study of the serious problem of pollution of streams by waste waters from mines is being conducted. Health hazards in the use of ethyl gasoline were investigated.

As the result of studies by Bureau engineers, definite increases in the production of lump coal in mines have been attained through more efficient use of explosives. The use of liquid oxygen explosives in the mining and quarrying industries has been investigated.

Studies have been conducted looking toward the utilization of vast deposits of low-grade iron ores in Minnesota, Alabama and elsewhere. As an aid to this study, the Bureau operated at its Minneapolis station the only experimental blast furnace in the world capable of producing conditions encountered in the large commercial furnaces. Studies designed to liberate the United States from dependence on imported high-grade manganese ores and manganese alloys, essential in steel making, are in progress. It is estimated that in the Rocky Mountain district alone the grinding of ores wears away more than 200,000 pounds of mill balls daily (*Continued on page 913*)

INTERNATIONAL BITUMINOUS CONFERENCE

Important Fuel Questions Discussed At Pittsburgh Meeting Of Scientists And Experts On Problems Affecting The Production And Use Of Bituminous—Advances In Coal Technology Noted—Artificial Hard Coal From Bituminous

LEADING coal operators and mining engineers of the country participated with eminent European scientists in a discussion of bituminous coal and means of extending its utilization at an international conference at Pittsburgh during the week of November 15-18 under the auspices of the Carnegie Institute of Technology.

In an address on the coal supply of the United States, M. R. Campbell, of the Geological Survey, estimated that the unmined coal tonnage of the country amounts to 3,444 billion tons. In Wyoming there is a vein of coal 100 feet thick. He stated that anthracite would be the first grade of coal to become exhausted, followed by semi-bituminous, with lignite last. He stressed the importance of utilizing low grade coal to conserve the resources of higher grades.

President Thomas S. Baker, of the Carnegie Institute, advocated the establishment of a foundation for the study of coal, so as to relieve the country from dependence on experts of other lands in the development of scientific processes for the treatment and utilization of fuel.

Dr. Friedrich Bergius, of Germany, spoke of the production of oil from coal under high pressure, stating that a ton of bituminous would yield 140 gallons of oil. He stated that nearly all grades of coal and lignite, except anthracite, can be liquefied, but that extensive research for at least 12 years and the expenditure of millions of dollars is necessary to make the process economically successful.

Research by public and private agencies on the more economical utilization of fuel and the prevention of its waste was recommended by A. C. Fieldner of the Bureau of Mines. "We are still heating our homes by the laborious method of the last century, whereas lighting, transportation and refrigeration have progressed tremendously," he said. "The same amount of competent research on coal, its combustion, and transformation would have made this conference possible 20 years ago. The depletion of petroleum and natural gas has directed attention to the need for augmenting and eventually replacing these fuels with products derived from coal. We must not waste our reserves of coal, in view of the new demands that will be made upon them. We should husband the definitely limited fuel reserves."

General Georges Patart, of France,

delivered an interesting paper on the industrial transformation of bituminous into organic technical products. He spoke of bituminous as a raw material for the organic chemical industry, by-products of the distillation of coal, low temperature distillation, fractionation of coal by solvents, hydrogenation of coals, distillation of coal under pressure, liquid fuels, and the future of synthetic products derived from coal. He stated that coal may come into competition with crops and that the factory may supplant the farm in many cases.

George A. Crook, consulting engineer of New York, said the operation of power plants at the mouth of mines is limited by water supply and the cost of transmission of electrical power. He said the most successful installations would be those near large markets for power, close to mines, and on large rivers or lakes.

It was stated by Henry Kreisinger, of the International Combustion Engineering Corporation of New York that pulverized coal is being extensively used. He said a Milwaukee steam plant is operating at the high pressure of 1,200 pounds per square inch. Walter E. Trent, president of the Trent Process Co., of New York, described the method of pulverizing coal and stated that it will make available for use large deposits of super-anthracite in Rhode Island, which is now worthless.

BITUMINOUS IMPORTANCE

The important place of bituminous in the life and industry of the country was spoken of by Walter Barnum, president of the National Coal Association, who deprecated attempts by legislation to regulate the coal industry. He predicted that bituminous would ultimately replace petroleum as a fuel. He explained the nature of research work which is now under way in connection with developing new uses of bituminous. "Bituminous will continue to be the principal industrial and domestic fuel supply of the nation," said Mr. Barnum. He explained that the only interference to the proper functioning of the bituminous industry had been through labor and transportation tie-ups. He stated that the danger from disorganization of the industry by labor disturbances had been decreased by the reduction of union operation and the increase of output by non-union mines. He stated that the United States had improved its mining conditions and increased its output of

fuel without any undue increase in the labor supply.

Edwin E. Slossen, editor of Science Service, said this is a new era in the utilization of coal. "We are beginning to realize the value of coal as a source of raw material for the synthetic chemist," he stated. He added that anthracite is not so useful from the standpoint of the chemist. "It is interesting to watch the chemists seek to find out how many different things they can make out of coal," he said. "Petroleum can be made from coal, and some day we shall have to make it that way."

Consulting Engineer R. Lessing, of London, stated that in order to save transportation costs and burn fuel more efficiently, the world must learn how to prepare coal for the market so that the ashes are eliminated at the starting point. "To carry ashes to furnaces and dispose of them after the coal is burned, costs England \$80,000,000 a year," he said.

Louis C. Jones, an engineer of New York, stated that 80 percent of the artificial nitrogen fertilizer is made by means of coal. He said the production of fixed nitrogen in industrial centers by the use of hydroelectric power does not appear to be economical. He discussed the production of sulphate of ammonia as a by-product of the steel industry.

COAL CARBONIZATION

Consulting Engineer G. M. Gill, of London, said that the carbonizing of coal is essential if only for war purposes. "No country, for its safety's sake, can afford to neglect the development of its coal resources in the direction of coal carbonization," he said. "There will be a great growth in the quantity of coal carbonized to take the place of the failing natural gas supply, and in order to reduce the quantity of oil used for gas making. The uses for oil are expanding so rapidly that the price is likely to rise above that at which it would pay to gasify it."

In urging steps to relieve the smoke problem in cities Osborn Monnett, consulting engineer of Chicago, said that as far as the great mass of small household heating plants are concerned, there has been no advance in the method of burning coal in the last 100 years. He advocated the use of prepared smokeless fuel. The subject was also discussed by Dr. H. C. Porter, of Philadelphia, who advocated the use of good methods and equipment in the burning of raw coal, and the (Continued on page 915)



Gold Circle Mill Nearing Completion

According to the Nevada Press, grading has been completed for the cyanide mill of the Gold Circle Consolidated Mines, concrete work on the plant is nearly finished and a new road, eventually to be used as the grade for a tramway connecting the Missing Link and Grant shafts with the mill, is also completed. The mill site is just below the Grant shaft, on a natural slope and at the lowest point on the properties owned by the company. Structural work will begin at once, and it is expected by President N. H. Getchell that the mill will be operating in February. Nearly all heavy machinery and equipment is now on the ground.

Work of the company has centered principally in four mines, the Grant, Missing Link, Elko Prince and Hutchinson. Ore now blocked in the Grant mine above water level will supply the mill at capacity until next summer, when reserves can be drawn to good advantage from other points. The metal content of the ore is nearly all gold.

Phelps Dodge to Develop Warren Claims

The Phelps Dodge Corporation Copper Queen Branches at Bisbee has announced that it will immediately begin the systematic development of the mining claims purchased several years ago from the Warren Realty and Development Co. Bids have already been requested for the sinking of a three compartment shaft. Actual work on which will be begun before the end of this year.

Otisco Group Purchased

The General Development Co. has purchased the lease on the Otischo group of claims which lie east of the properties of the Butte Copper and Zinc Co. in Montana. Glen Anderson, who is also manager of the Butte Copper Hill Mining Co., is to be manager at this property also.

United Verde Enters Bisbee Field

The United Verde Extension Mining Co. of Jerome, Ariz., has taken over control of the Bisbee Queen Development Co. It is understood that a development shaft will be started immediately. It is understood that this company will expend a large sum in development work and that a new company will be formed to handle this property.

Callahan Zinc Again Productive

The Callahan Zinc-Lead Co., Wallace, Idaho, is again on a producing basis after suspending operations for more than two years. It is understood that this company will remodel the old Callahan mill, using the flotation process exclusively. A statement of the company says that there is a large tonnage in the mine above the 600-foot level awaiting development and that the company anticipates carrying on considerable exploration work. Tests which have been made indicate that the ore can now be treated profitably by flotation.

Drilling on Stratton Estate

Among the Colorado properties showing increased activity is the Stratton Estate at Cripple Creek. Three diamond drill holes have been put down to test out the geological formation of their Ironclad and Globe Hill properties. Sullivan Machinery Co., of Chicago, has the contract for drilling.

Joplin District Gets Three Mills

Three mills have been completed in the Tri-State District: One by the Century Zinc Co. at Baxter Springs, Kans., one by the Tulsa Lead and Zinc Co. at Tulsa, Okla., and the third by the Kansas Exploration Co. The mill of the Century Zinc Co. is new and is thoroughly modern and equipped with a large crushing plant and flotation plant.

Utah Metal and Tunnel Development Work Progressing

The development campaign of the Utah Metal and Tunnel Co. is reported to have disclosed some very interesting ore possibilities at their property, consisting of about 4,000 acres of mineral lands on West Mountain, adjoining the holdings of Utah-Delaware Mining, Utah Copper and U. S. Smelting. Early this year the Utah-Delaware Mining Co., controlled indirectly by Anaconda, leased a part of Utah Metal & Tunnel's property for a term of five years, the latter to receive as royalties 15 to 30 percent. According to the terms of the contract Utah-Delaware was to supply the other company with funds sufficient to carry on an extensive development program. Some gratifying values in lead-silver ores may be encountered as a result of the efficient working of the properties now going on.

World's Largest Chrome Ore Deposit In Montana

What is said to be the largest known chrome ore deposit in the world has been discovered near Columbus, Mont., on the edge of the Yellowstone National Park. Prof. James F. Kemp, of Columbia University, after a close scrutiny in company with representatives of the U. S. Geological Survey, announced that the find is of importance to the metal industry of the world, not only because of the rust-resisting properties of chromium steel alloys, but also because chromium is supplanting nickel in the electroplating industry, its only disadvantage having heretofore been its higher cost. Practically all of the chrome ore used in this country previously has been mined in Rhodesia, South Africa, selling in this country at about \$40 a ton. The Montana ore, after being refined at smelters and chemical plants now being erected, can be sold at about \$20 a ton.

The property where this deposit is located is known as the Benbow group of seven claims which has been taken over by the American Chrome Products Co., recently organized. Officers of the company include James H. Rowe, Paul A. Gow, W. D. Kyle and Angus B. McLeod, of Butte, and Peter G. Grant, of New York.

Comstock Merger to Suspend Operations

The Comstock Merger Mines, Inc., of Virginia City, Nevada, has announced its intention to suspend operations in December. The failure has not resulted because costs are higher than was estimated, but because ore grades were much lower than was indicated by careful sampling of what at the time appeared to be a sufficient number of crosscuts. The recent very drastic drop in the silver market undoubtedly is a strong influence in the closing of the properties. The property has employed approximately 500 men.

New Mill for Commerce

The Commerce Mining and Royalty Co. will replace the wooden mill on the Blue Goose lease near Carden, Okla., which was destroyed some weeks ago by fire with a steel concentrator. The Blue Goose Mine is one of the largest producers in this section.

Potosi Mine Sold

The Potosi Mine in the Yellow Pine Mining District, Nevada, has been sold by the Empire Zinc Co. to the International Smelting Co. The Potosi Mine has for some years been an important producer of lead zinc ore in this section, and is said to have realized for the Empire Zinc Co. approximately \$3,000,000 in profits. According to the Nevada State Press, the entrance of the International Smelting Co. in this district insures increased activity.

Greene Cananea Makes Important Discovery

In a letter to stockholders President W. D. Thornton, of the Greene Cananea Copper Co., tells of the discovery through drill holes of an important body of ore said to be considerably higher in grade than any within the company's other mines. Mr. Thornton stated that it is impossible to make a definite statement as to the average grade or tonnage, due to the steep dip of the ore chute. This company has for a considerable length of time been prospecting by means of churn drilling over a large area of the mineralized land at Cananea.

Union Carbide Buys Vanadium Property

Union Carbide & Carbon Corp. has exercised an option to purchase the entire assets of the U. S. Vanadium Co., effective as of December 1. The Carbide company has been negotiating for and developing the ore bodies and processes of the Vanadium company for the last year, and are satisfied that the property will develop into one of the largest producers of vanadium.

This property is located at Rifle, Garfield County, Colorado, 300 miles west of Denver. The ore is mined about 12 miles from Rifle and hauled from the mine to Rifle for treatment in a large plant, the capacity of which has been trebled during the past year. The U. S. Vanadium Co. has also a smelting plant at Columbia, Ohio, and has furnished one of the highest grades of ferro-vanadium that is on the market. Their product has been satisfactorily used by the steel trade in the United States and has also been shipped abroad in considerable quantities.

The ore bodies as developed have proven a blocked out tonnage sufficient to take care of the trade for sometime to come, and additional development work is proving larger tonnages from month to month. This brings Colorado to be the largest producer of vanadium in the United States and is of considerable value from the raw material standpoint to the United States.

The sale of both the oxide and the ferrovanadium will be handled by one of the subsidiaries of the Union Carbide & Carbon Corp., the Electro Metallurgical Sales Corp.

NEW METHOD OF REDUCING IRON ORE

A new method of reducing iron ore to steel without the use of blast furnaces is reported to have been developed by a Dutch engineer named Croess and placed in successful operation in England. It is stated in *The Netherlands* that the new process soon will be tried out in Canada.

The method of procedure of the new process is said to be as follows: The iron sand is brought into a furnace from above and falls through a cylindrical screen below. On its way downward it passes a light arc which immediately changes it into molten steel and causes it to undergo further metallurgical adaptations. A regular stream of steel is thus formed, which is caught at the bottom of the crucible and can be tapped off from it. On passing the light arc the impurities in the metal are turned into gas which, after cleansing, can be used for starting the dynamo motor, it is said.

The inventor of the process is said to contemplate the use of the iron sand over for melting common iron ores. In such case, he states, the crude ore would first be broken into small pieces by an ore breaker and then ground to powder in mills. The powdered ore would then be drawn from the clay, sand and other impurities by means of a magnetic separator. The inventor claims that, by the elimination of blast furnaces, the production of steel can be accomplished at a considerably lower cost than with the use of the furnaces.

Removal of Gold Embargo Believed Unlikely in Japan

Although the Japanese Government has made no official announcement concerning any possibilities of the removal of that country's embargo on gold it is considered in well-informed financial circles in Japan that there is no immediate likelihood of such action, states a report to the Department of Commerce from Commercial Attache C. E. Herring, at Tokyo. It is said in Japan that government and private commitments abroad are such that existing gold reserves could not be dissipated without unfavorable results. Prospects for the trade balance this year are also stated in Japan to be of such a nature as render inadvisable the removal of the gold embargo.

Consolidated Copper Mines Sinking New Shaft

The Consolidated Copper Mines Corporation has started work in sinking a new shaft on the Emma claim. The shaft is now down more than 30 feet and will go to 750 feet. It is a duplicate of the shaft of the Nevada Consolidated Copper Co. and will develop territory that includes all of the west end of the open pit. The company is preparing to resume surface leaching.

Utah Copper Tries Out Locomotive

Two different kinds of electric locomotives are now being tried out by the Utah Copper Co. One is an oil electric locomotive built by Ingersoll Rand Co. and the other is a combination trolley and storage battery type built by the General Electric Co.

Penrose Mines Incorporation

Articles of incorporation have been filed by the Penrose Mines, Inc. This company will operate in the famous Downtown District at Leadville, Colo. Jesse F. McDonald, former governor of Colorado and prominent mining man of Leadville, with C. J. Walker, of St. Louis, are the leading factors in the organization of this company, which will use the Penrose as the base of operation and will install modern equipment.

Barnes Heckler Mine Disaster

One of the greatest mine disasters in the history of the Lake Superior District occurred on November 3, when 51 men lost their lives in the Barnes Heckler Mine of the Cleveland Cliffs Iron Co., near Ishpeming, Mich. A large block of ground broke loose, causing a cave through to the surface, and within 15 minutes the mine was filled with quicksand and water, only one man escaping alive.

Silver Situation in Bombay

Silver imports into Bombay, India, during the week ended November 13, amounted to 2,109,000 ounces from Shanghai and 314,000 ounces from New York, according to cabled advices to the Department of Commerce from the Bombay office of the department. Silver coin in the Indian currency reserve totaled 960,840,000 rupees on October 31 while bullion amounted to 803,000,000 rupees.

Bombay stocks of silver total about 6,000 bars. The market seems to have improved, although rather uncertain as yet. In comparison with the previous week there was a decrease in the imports of about 600,000 ounces also. The silver stocks in Bombay increased by some 2,000 bars over the estimates of the previous week.

General Improvement in Alaskan Conditions

A general improvement in conditions affecting the welfare of Alaska, with a balance of trade in favor of the Territory amounting to \$29,024,224, was reported by the Governor of Alaska in his annual report to the Secretary of the Interior made public recently.

Fisheries, the principal industry of Alaska, showed an expansion as a whole in 1925 over the preceding year. Renewed activity was apparent in many of the mining districts of Alaska, the report states, with extensive developments in the Fairbanks district where prospecting for lode and placer deposits is in progress. Alaska mines in 1925 produced \$18,220,692 worth of minerals as compared with \$17,457,333 for the preceding year, a gain of \$763,359. A decrease occurred in the output of copper, although its value was increased because of better prices. There was a moderate increase in the value of gold, silver, tin, and lead products.

A reduction of \$504,795.32 or 30 percent in the annual deficit of the Alaska Railroad during the fiscal year of 1926 was announced. The deficit for 1926 amounted to \$1,169,202.04 as compared with \$1,673,997.36 for the year of 1925. According to the report, the revenues of the road increased during the year by \$206,274.63 while the annual maintenance and operation cost including replacements was reduced over the preceding year by \$298,520.69. A reduction of \$136,480 was effected in the road's pay roll. The report states that the general policy of the Alaska Railroad remained unchanged during the year. This policy calls for the completion of the railroad and the purchase of modern equipment at an estimated cost of \$11,878,781. With the expenditure of this sum the cost of operation and maintenance, which now stands at a high figure, will be reduced to a normal outlay annually. Because appropriations so far made have provided only \$1,865,000, including \$500,000 available May 10, 1926, the greater part of the construction work proposed to complete the road has not been done.

Commercial freight on the rail line, exclusive of coal, to the amount of 32,483 tons, an increase of 7,044 tons over the previous year, the report states. Coal tonnage for the year was 32,553, an increase of 4,127 tons. The total commercial tonnage hauled over the road for 1926 was 65,036 or a gain of 11,171 tons. The number of revenue passengers transported over the road was 57,567 in 1926, an increase of 9,267 over 1925. The increase in tonnage was due to increased shipment of mining machinery and supplies for mining operations into Alaska. There was also a general increase in shipments of all kinds of commodities.

PHELPS DODGE PLANS IMPROVEMENTS

Messrs. Walter Douglas and P. G. Beckett are making their annual inspection trip over the properties of the Phelps Dodge Corporation. This company has announced an extensive development campaign in the Warren District, Bisbee, Ariz., in addition to improvements at the Douglas smelters. A three-compartment shaft is to be sunk on claims purchased some years ago from the Warren Realty and Development Co. Work will begin on the new shaft within the next 30 days, but the completion of their improvement program will probably take five years. The company has also announced the erection of a concentrating plant for lead zinc ores near Warren and a smelting and refining plant at Douglas, Ariz., the work upon which will begin immediately. It is understood that the new lead concentrator will be an entirely separate plant from the copper ores concentrator already in operation in this district, and will be designed to handle custom ores as well as sulphide ores. It is understood that the flow sheet will follow the present flow sheet of the Shattuck Denn Concentrator.

Flotation of Oxidized Ores

Oxidized ores, particularly of the lead-silver type, are now being treated successfully and profitably by flotation at several mills in the United States and Mexico. Copper ores of the oxidized and semi-oxidized variety are also amenable to this treatment, and are actually being milled on a large scale. A paper on this subject, which will detail the practice at operating plants both in the United States and Mexico, is now being prepared by the Bureau of Mines. The paper will contain contributions from experts operating such plants.

Coking of Oil Shales

The formation of coke during the retorting of "coking" grades of oil shale can be prevented most effectively by using enough non-coking shale in the retort charge, according to the Bureau of Mines, which is conducting investigations which may point the way toward the commercial development of the nation's tremendous oil shale reserves. This precaution is especially practicable in the United States, as most of the de-

posits of oil shale in this country contain "noncoking" as well as "coking" beds.

To obtain oil from shale, the latter has to be heated in some form of retort to a temperature of about 1,000° F.; then the spent shale, at least 60 percent of the original charge, has to be removed from the retort. If the shale fuses during the retorting and forms a hard, tough coke, removal of the spent shale becomes exceedingly difficult. Fortunately this tendency to fuse is serious in only a few of the shales in this country, and when it exists it can usually be easily corrected.

The fusing or coking property of a shale does not seem to bear any direct relationship to the yield or the quality of the oil produced from the shale, but lean shales rarely form troublesome cokes. For example, when a sample from the mahogany stratum near Grand Valley, Colo., was retorted by the Bureau of Mines it shrank to two-thirds of its original volume and seemed to melt down, forming a dense, hard coke that adhered most tenaciously to the retort walls, whereas a very rich oil shale from Elko, Nev., did not show the slightest tendency to coke or stick to the walls of the retort. A massive black shale from near the top of the Green River formation in Colorado (about 600 or 700 feet higher in the series than the mahogany shale) formed a fairly strong coke which did not stick to the walls of the retort. The leaner shales that lie in the same stratum on either side of the coking mahogany shale do not coke, but the noncoking property of these shales may be due to the larger percentage of inorganic matter in them rather than to differences in the character of the organic constituents. An Australian oil shale giving an oil yield of 120 gallons to the ton had only a slight tendency to coke, but stuck together after retorting. A sample of Brazilian "turfa" yielding 115 gallons per ton formed a weak friable coke. A 50-gallon shale from Soldier Summit, Utah, did not coke at all.

The Bureau of Mines investigators conclude that the fusing or coking property of shales does not bear any direct relationship to the yield or quality of the oil produced from the shale.

The results of this study of the coking of oil shales are contained in Bureau of Mines Technical Paper 398, by W. L. Finley and A. D. Bauer. Copies of Technical Paper 398, which is one of a series giving the results of oil shale investigations conducted by the Bureau of Mines in cooperation with the State of Colorado, may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 5 cents.

Missouri Strip Coal Mines

The Winston Deer Co., of Hibbing, Minn., has announced the securing of a contract for coal stripping near Higbee, Mo. They also announce a contract for developing a strip coal mine near Smith River, Ohio.

New Stripping Operation

The Lehigh Valley Coal Co. has awarded to the Butler Construction Co., of Hazleton, a contract to strip the anthracite territory between Coleraine and Trescow. Engineers have estimated that it will require eight years to complete the stripping contract with an estimated cost of \$800,000 to remove the top rock and clay.

To Drive New Tunnel

The Hazle Brook Coal Co. has awarded a contract to drive a tunnel 1 mile long from the Mid-Valley Mines to the old Reno workings, once operated by the Lehigh Valley Coal Co. Work on the tunnel is expected to take at least a year and a half.

Coal Merger

The Bewley-Darst Coal Co., of Knoxville, and the Holmes Coal Sales Co., of Cincinnati, have merged into a company to be known as the Holmes-Darst Coal Co., with headquarters in the Dixie Terminal Building, Cincinnati, Ohio.

Old Ben Resumes Operation

Old Ben Coal Co.'s mine at West Frankfort has resumed operation after suspension of nine months. It is anticipated that their normal production record of 5,000 tons daily will soon be reached. The property employs 750 men, most of whom have been idle since February 6, 1926.

Blue Diamond Coal Co. Organized

Five coal companies have merged with the Blue Diamond Sales Corporation in the incorporation of the Blue Diamond Coal Co., having a capital stock of \$5,500,000. The mines are situated in southeastern Kentucky, eastern Tennessee and western Virginia. Alex Bonnyman, of Knoxville, Tenn., is chairman of the board of directors; James Bonnyman is president of the sales company and will be president of the newly organized company. The other officers are Fred E. Gore, Cincinnati, Ohio; H. C. Williams, Middlesboro, Ky.; W. H. Sienknecht, Robert S. Young, Knoxville. This combination puts into operation one of the largest commercial bituminous coal producers south of the West Virginia field. The annual capacity of its properties is estimated at 3,000,000 tons.

ILLINOIS STRIP MINES

It is anticipated that plans for development of strip coal mines in Williamson County, Ill., will now go rapidly forward, due to the decision of the Interstate Commerce Commission approving the acquisition by the Missouri Pacific Railroad of the capital stock of the Marion and Eastern Railway Co. Relative to the plans for the development of these strip mines, the commission's decision says:

"The principal industry in the territory is coal mining. The Marion's railroad serves five well-developed shaft mines with a combined daily potential capacity of 16,500 tons. It is estimated that the undeveloped acreage tributary to the line contains sufficient coal for from 75 to 100 years' operations, based upon the average run of the mines. It is further estimated that the territory contains from 75,000,000 to 100,000,000 tons of coal which can be mined by stripping operations. On behalf of the applicant it is testified that the output from the Illinois mines served by it is lessening; that a number of the mines on its rails in Williamson County have been worked out and abandoned; that to maintain and increase its coal traffic it must look to strip coal deposits; and that the strip coal deposits in the section served by the Marion are the only ones in this territory which can be served by the applicant.

"It appears that there has been an increased demand for strip coal acreage since this application was filed; that practically every acre of proven coal land adjacent to the Marion's line has been acquired, leased, or placed under option and that arrangements have been made or are in progress to open up practically all of the strip coal as soon as it is determined definitely that the applicant will acquire control of the Marion. The development of the strip coal acreage would require the construction of certain extensions which the Marion is unable to build because of financial limitations.

"For the five years ended December 31, 1924, the coal tonnage of the

Marion average 717,532 tons a year. On the basis of present divisions this would yield an annual gross revenue to the Marion of \$157,907. The applicant estimates that if the Marion were under its control the net revenue would equal 25 percent of the gross.

"With the probable opening of new mines and the production of strip coal it is thought that the coal traffic over the Marion's line can be increased to 1,000,000 tons a year. The estimated revenue therefrom to the applicant and the Marion, taken together, is \$1 per ton. The net railway operating revenue accruing to the applicant therefrom would be approximately \$100,000. This estimate assumes an operating ratio of 78.17 percent, which was the operating ratio in 1925. Much of the Marion's present coal traffic is interchanged with the applicant and a considerable portion moves through the Omaha gateway.

"The towns of Pittsburg, Paulton, and Scranton, with approximate populations of 3,700, 500, and 300, respectively, under normal conditions in the coal mining industry, are located on the Marion's railroad and are not served by any other carrier.

"It appears that the proposed acquisition will assure to the towns and communities located on the line a regular and dependable transportation service, will result in the establishment of through rates on all commodities, will enable the towns and shipping points served to compete on equal terms with adjacent cities and towns located on the lines of other carriers, and will benefit shippers through the ability of the applicant to furnish an adequate car supply. If the proposed acquisition be authorized, the railroad of the Marion will continue to be operated as a separate property, but such operations will be supervised by the applicant's present forces. Elimination of the Marion's supervisory organization is expected to result in an annual saving of approximately \$20,000."

Colorado Coal Production Increases

James Dalrymple, state coal mine inspector, in his monthly report, estimates for the first nine months of 1926 Colorado's coal production increased 177,418 tons over the corresponding period of 1925. The total production for the nine-month period is 6,852,755 tons.

To Study Mining Conditions

The University of West Virginia, through its mining department, is making a study of mining conditions in the state. The information so obtained will be published in pamphlet form. The work is under direction of H. G. Kennedy and I. A. Gibban.

Ford Mine Resumes Production

Mine No. 2, of the Ford Collieries Co., at Curtisville, Pa., which has been closed for more than two years was reopened November 3 with the employment of approximately 500 men.

Lillybrook Coal Gets New Management

E. E. Jones, for some time mine superintendent for the E. E. White coal interests, has been appointed general manager of the Lillybrook Coal Co., with headquarters at Lillybrook, W. Va. The Lillybrook is now the third largest producing group in the Winding Gulf field and has inaugurated an impressive program for beautifying the camp.

Operating Personnel Changed

The Glen Alden Coal Co., Scranton, Pa., through Maj. W. W. Inglis, president, has announced the following changes in the operating personnel: George O'Hara has been promoted from general mine inspector to assistant to the general manager; P. H. Devers, formerly superintendent of the Truesdale Colliery, has also been named assistant to the general manager; David Girvin, formerly superintendent of the Bliss Colliery, has been appointed superintendent of the Truesdale Colliery; Henry Kittle has been transferred from the Avondale Colliery to the Bliss Colliery; Samuel Harrison has been promoted to superintendent at Avondale and Thomas Millington has been appointed superintendent at Loomis.

Gold Medal for Anthracite Exhibit

The International Jury of Awards of the Sesquicentennial International Exposition has awarded the Anthracite Operators' Conference a medal of honor "for the comprehensive and educational exhibit covering all phases of Anthracite Mining Industry."

The exhibit of the Anthracite Operators at the Sesquicentennial Exposition was opened July 1, 1926. The attendance during the first month was small and it was not until August 2 that the public began to take an interest. From that time until November 21 approximately 288,500 people were recorded as visitors to the anthracite exhibit.

The majority of the visitors showed great interest in the exhibit and while some criticism was heard in connection with the new sizes of Anthracite, it was quite evident from the comments offered that the public took real interest in learning at first hand some of the important phases of anthracite mining.

Interest was maintained to the last day and the attendance towards the close was still heavy, the average daily attendance for the last week being approximately 2,500.

STATISTICS OF UNDERGROUND LOADING MACHINES IN USE IN BITUMINOUS COAL MINES

A rapid increase in the number of underground loading machines in bituminous coal mines is shown by a statistical canvass just completed by the United States Bureau of Mines. In 1925, a total of 95 mines in 15 states had installed 340 machines which loaded 6,243,104 net tons of coal. Fourteen other mines had 42 machines but did not report the tonnage loaded by them, but in most of this group the installations were experimental and only small amounts of coal had been loaded. In 1923 the quantity loaded was reported to be 1,879,726 tons.

Preliminary reports received from manufacturers of loading machines and mine operators indicate that when the complete figures for 1926 are collected, a further increase will be shown in the use of loading machines, in the number of mines employing them, and in the total tonnage of machine-loaded coal.

Belgian Coal Cleaning Process to Be Tried Out

A Belgian coal separation process, which it is claimed will revolutionize the anthracite industry, is now in operation at the new Lattimer No. 6 breaker of Pardee Bros. & Co., at Lattimer Mines, Pa. Its installation is said to have cost \$150,000, it being the first of its kind in the United States. The old gold mining system of sluices has been converted into a plan for cleaning coal in Belgium, and is said to have been very successful.

New Breaker in Operation at Gowen, Pa.

One hundred and fifty men have been given employment by the Buck Mountain Coal Co., which has started its new breaker at Gowen, Pa. The mine was leased from Cox Bros. & Co. by Philadelphia and Hazleton capitalists back in 1925, after having been idle for many years, although coal has been taken from some veins quite recently, and its preparation taken care of in the Lehigh Valley shaft breaker at Hazleton.

The interior of the mine was put in working condition during the recent anthracite strike, permission to do this work having been granted by the United Mine Workers. Power furnished by the Pennsylvania Power and Light Co. will be used in the operation of this breaker.

Pittsburgh Terminal Coal

According to an announcement in the trade press, C. E. Tuttle has resigned as chairman and president of the Pittsburgh Terminal Coal Corporation and as vice president of the North American Coal Corporation. It is understood that he will devote his time to the Tuttle Corporation, which is engaged in the operation of bituminous coal mines and which represents investors in coal properties in an advisory capacity. According to the statement, the Pittsburgh Terminal Coal Corporation properties have been completely rehabilitated and modernized during his administration, and their output increased from a little more than 1,000,000 tons in 1922 to more than 4,000,000 tons in 1926.

Nason Mine Reopened

The Nason mine, at Nason, Jefferson County, Ill., has been reopened by Rice Miller, of Hillsboro, receiver. The mine has a twin tippie designed for a daily capacity of 10,000 tons and is owned by the Illinois Coal Corporation, of which Albert J. Nason is president. The corporation failed a year ago. Previous to that time the mine was heralded as the coming largest mine in the world. Equipment in the mine at present is not sufficient for the maximum tonnage, but it is expected to produce between 3,000 and 4,000 tons a day.

New Orient Establishes New Record

The New Orient mine of the Chicago, Wilmington & Franklin Coal Co., at West Frankfort, Ill., has set a new world's record in hoisting coal, which eclipses previous marks by approximately a thousand tons. The previous world's mark which was held by the New Orient, showed a tonnage of 12,825 tons. The mark recently established is 13,563 tons. A total of 1,175 skips were necessary to establish this new mark, requiring 266 railroad cars to carry the output away from the mine. Two thousand six hundred and twenty-four mine cars were loaded.

Sunday Creek Acquires Acreage in Hocking Field

The Sunday Creek Coal Co. has closed a deal whereby it secures all of the holdings of the New Pittsburgh Coal Co. in the Hocking Valley region. This property consists of three operating mines and approximately 3,200 acres of coal lands. It is understood that these mines which have been closed for several years will immediately be put into operation under the direction of O. S. Newton, who will take personal charge.

Carnegie Reopens Mines

The Carnegie Dock and Fuel Co. has announced the reopening of three of its bituminous mines in the Pittsburgh thin vein district.

Kentucky Coal Property Changes Hands

The Montgomery Creek Coal Corporation's property and equipment in Perry County, Ky., has been purchased by the Ryley Coal Co. of Lexington, Ky. The new owners plan to increase the production of this property installing new machinery, particularly that of coal preparation.

Jeddo-Highland Financing Plans

Philadelphia bond houses are offering \$4,000,000 Jeddo-Highland Coal Co. first closed mortgage leasehold 6 percent bonds, running until November 1, 1941, to the general public. This marks a change in the administration of the Jeddo-Highland Co., as it means the retirement of Mr. John Markle from the presidency. He will be succeeded by Mr. Donald Markle. Aside from this change, the management and stockholders of the company will remain substantially the same. Published announcements say that the proceeds of the bond issue, together with \$1,255,000 non-interest bearing second mortgage bonds, will constitute part of the consideration to be paid Mr. John Markle for more than 50 percent of the Jeddo-Highland Coal Co. and 50 percent of the stock of the Jeddo Supply Co. The coal property, held in fee or on long-term leases, embraces about 6,400 acres, and engineers estimate that, at a safe minimum, there are 16,600,000 tons of recoverable coal.

Coal-Ash Fusibility as Related to Clinker Formation

Tests of the fusibility of coal ash and the relation of such tests to the clinkering characteristics of the coal are being conducted at the Pittsburgh Experiment Station of the Bureau of Mines. While laboratory methods for determining fusibility of ash have been carefully investigated by the bureau and standardized, no comprehensive study has hitherto been made as to how accurately such laboratory tests predict clinker trouble in burning coal. Seven different coals having a wide range of ash fusibility were tested for fusibility by the standard method worked out by the bureau, and two other well-known methods. The coals were studied as to the distribution and composition of the ash-forming constituents, the sulphur content, and fusibility of ash. Firing tests were made on the same coals in a special hand-fired furnace developed by the bureau engineers. The results of the fusibility tests were generally

JACKLING RECEIVES GOLD MEDAL

The Mining and Metallurgical Society of America, at a dinner at Waldorf Hotel on October 28, presented to Daniel C. Jackling the gold medal for distinguished service. The award was made as the result of a virtually unanimous letter ballot of all the members of the society, and the presentation ceremony was attended by some 150 members and friends that included the leaders in the mining industry throughout America. Clinton H. Crane, president of the Mining and Metallurgical Society presided, reading a large number of congratulatory messages from those who were unable to attend, including Herbert Hoover; George Dern, Governor of Utah; Senators Smoot and King, of Utah; and Spencer Penrose. Special remarks were made by Charles Hayden, of Hayden, Stone & Co., who financed Jackling's Co., Bernard M. Baruch, Louis S. Cates and Cornelius F. Kelley.

found to be indicative of the clinkering trouble that was experienced in burning the coals. The work is being continued on other coals.

Coal Flows Like Liquid

Walter E. Trent, president of the Trent Process Co., of New York, before the International Conference on Bituminous Coal, explained a method of making pulverized coal flow as a liquid, saying:

"Pulverized coal can be made to flow and run, and seek its level. The mere heating of pulverized bituminous coal to a point at which vapors are generated (either chemical water or hydrocarbons) gives to the coal a state of great mobility. In this condition it resembles liquids and answers the common law of fluids.

"The coal particles become enlivened by the vapors issuing therefrom. These vapors form bubbles, or casings, around each and every particle and reduce friction to such a degree that the angle of repose of the coal becomes horizontal, level."

Study of Alabama Coals

A specific gravity study of Alabama coals has been undertaken by the South-

ern Experiment Station of the Bureau of Mines. This problem has been taken up for the purpose of obtaining essential data as to physical characteristics of Alabama coals and impurities in the coal beds. A University of Alabama fellow-ship man has been assigned the problem of making specific gravity determinations and getting the necessary data as to the chemical characteristics of the samples.

Coal-Mine Royalties in Illinois

The results of a study of coal-mine royalties and leasing conditions in Macoupin, Sangamon, and Montgomery Counties, District VII, Illinois, are contained in Serial 2780, recently issued by the Bureau of Mines. This is the third of a series of reports on coal-mine royalties and leasing conditions in Illinois, results of similar studies in Districts VI and VIII having been published some months ago. In the preparation of this report, the objectives were to obtain data which may be used in the preparation of coal-mining leases, so that the most important factors in the lease governing the mining of coal may be set forth in unmistakable language and thus lessen the chances of litigation, and to provide a general knowledge of leasing royalties and values in this section of the state of Illinois.

Smokeless Coal

The term "smokeless coal" is a challenge to the combustion engineer, according to O. P. Hood, chief mechanical engineer of the Bureau of Mines, in an address before the recent conference on bituminous coal at Pittsburgh, Pa. None of his art is needed to make anthracite and coke burn smokelessly, but as increasing amounts of volatile matter are associated in the fuel, more and more demands are made upon his skill in furnace design, in adaptation to service, and to care in operation to keep within absolute or even practical smokeless limits. Illustrations can be found of smokeless performance of every fuel, so that the statement can be made "that it can be done." That it is not done simply indicates that it is not wanted badly enough to pay the price. Most engineering is a compromise among conflicting requirements. Smokeless operation usually requires the cooperation of several interests, sometimes management of a high order, and often a degree of care and attention difficult to buy. Financial and operating limitations are many. All of these elements enter into the practicability of attaining smokeless operation, and obviously each case must be considered by itself.

Consumers' Stocks of Coal Increase in Spite of Extraordinary Export Demand

Consumers' stocks of bituminous coal have increased in spite of the extraordinary exports stimulated by the great strike of the British miners, according to a survey as of October 1, completed by the Bureau of Mines, early in November.

Bituminous coal is very rarely stored at the mines, the Bureau explains. The important element in the stocks is the quantity held by consumers. On October 1, commercial consumers and retail dealers had on hand a total of 44,000,000 tons of bituminous coal. This was 5,000,000 tons more than the stock on July 1, indicating that production in August and September was sufficient to supply domestic consumption and provide a surplus for storage, in addition to the large amounts exported.

The total stocks compared favorably with those on similar dates of the last two years. On September 1, 1924, the stocks were 47,000,000 tons, on September 1, 1925, they were 43,000,000 tons and on November 1, 1925, about 48,000,000 tons.

At the rate of consumption in August and September, the stocks on October 1 were sufficient to last 35 days, if evenly divided. The condition in individual communities and establishments, however, varies widely. Some consumers protect themselves with heavy reserves and others carry little or none.

Developments since October 1, according to the Bureau, indicate that further additions have been made to stocks. Production of bituminous coal in October has been extremely heavy, averaging 12,315,000 tons a week. Consumption and exports in August and September averaged 10,273,000 tons a week, of which 936,000 tons was exports and 9,337,000 tons internal consumption. In spite of the abnormal demand, the actual exports absorbed only 9 per cent of the supply.

Stocks of anthracite in retail coal yards were not far from normal for this season of the year. The heavy production of anthracite since the settlement of the miners' strike last February has made it possible to build up reserves, and the dealers reporting had coal enough to last 46 days at the rate their customers were buying in August and September.

The docks on Lake Superior and Lake Michigan, which supply much of the Northwest, are well stocked with coal. On October 1 they had on hand a total of 7,488,000 tons of soft coal—nearly the same amount as last year, and 1,145,000 tons of anthracite—or much more than last year.

Sizing Action of a Coal-Washing Table

The prevailing practice of washing un-sized coal, one-half inch and finer, to one-eighth inch and finer, on a table is subject to certain limitations which are commonly overlooked. In some instances good results are obtained by this method, but often the opposite is true and the efficiency of the washing operation is low. Although the separation taking place on a concentrating table is not fully understood, the actual distribution of particles of various sizes and specific gravities was determined a number of years ago by ore-dressing investigators. Serial 2755, recently issued by the Bureau of Mines, consists of an analysis of an old problem by new methods. The experimental data on which the discussion is based were obtained in the course of coal-washing investigations conducted by the Bureau of Mines at the Northwest Experiment Station in cooperation with the University of Washington and with certain coal operators of that state.

The general method of studying has been to take a large number of zonal products from the table and separate them according to specific gravity and size into their component parts. The table used is one of the standard commercial sizes with a diagonal deck. The coal to be washed is split into representative portions, which are stored in separate bins. One portion is used for "tuning up" the table; the products are collected continuously in the same sludge tank and returned to the feed bin, and thus a closed circuit is completed. When the desired conditions on the table are obtained, coal is fed from one of the reserve bins. After the table is operating smoothly the entire product is caught for one minute; such a sample is sufficiently large to represent accurately the work of the table and at the same time to minimize the effect of variations. Beginning at the end next to the head motion, separate samples are made for each foot along the edge of the deck.

Each zonal sample is separated by the float-and-sink test into four products by the use of three solutions of definite specific gravities. The specific-gravity fractions resulting from the float-and-sink separations are sized with Tyler screens, and the moisture and ash content of each size determined. The final distribution of particles, according to size and to specific gravity, effected by the table is portrayed by this procedure.

Idaho Copper Loses Libel Suit

The Idaho Copper Corporation has lost its \$500,000 damage suit for libel brought against Stewart Campbell, state mining inspector for Idaho. Chief counsel for the copper company stated that an appeal would be taken to the United States Court of Appeals.

West Virginia Case Before I. C. C.

December 9 is the date set for the hearing before the Interstate Commerce Commission on the complaint filed by the Virginia Coal Operators' Association vs. The Chesapeake and Ohio Railway. The complaint states that for many years rates have been collected from Districts No. 1 and 2 on the same basis as from the Pocahontas and Tug River Districts of the Norfolk and Western and Virginian mines as well as the New River Districts of the C. and O. It is also stated that, notwithstanding the fact that this parity of rates is maintained to Potomac Yards and Washington, D. C., Clinch Valley mines are required to pay a higher rate when the delivery is on the Baltimore and Ohio Railway for Washington and suburban points.

Injunction Denied

The injunction filed against the Shattuck Arizona Copper Co. by a minority stockholder to prevent the incorporation of the new company, Shattuck Denn Mining Corporation, has been denied by the Duluth, Minn., District Court. The Minnesota Supreme Court, to which the case was appealed, sustained the decision of the lower court.

Supreme Court Makes Adverse Decision in Nevada Tax Case

The Supreme Court of the State of Nevada has handed down a decision in favor of the state in the appealed bullion tax case of the State vs. Tonopah Extension Mining Co. The Nevada State Constitution provides for taxation of the net proceeds of the mines, but does not clearly define just how net proceeds shall be determined. The State Tax Commission refused to allow depreciation insurance, taxes or cost of office maintenance outside of the state. The different companies in the absence of official information on the subject used different methods of calculating the bullion tax. In 1919 a test suit was brought against the Tonopah Co., but no action was taken and no decision rendered until 1925, when a decision was rendered in favor of the state. An appeal was taken, but the decision of the lower court was upheld. Many mining companies in Nevada are affected by this decision.

At the request of Dr. Hubert Work, Secretary of the Interior, with the approval of Charles H. Burke, Commissioner of Indian Affairs, the Institute for Government Research, a private organization at Washington, is to make a comprehensive general survey of Indian affairs. The survey is to embrace the educational, industrial, social and medical activities maintained among the Indians, their personal and civil rights, and their general economic conditions.

Anaconda-Clark Apex Litigation

The taking of evidence in the apex suit of the Moulton Mining Co. versus the Anaconda Copper Mining Co. has been completed before Judge Bourquin, of the Federal District Court, at Butte, Mont. The Clark interests, plaintiffs, were allowed until November 20 to file a brief and the defendant is allowed until December 20 to do the same. Following the filing of the defendant's brief, the plaintiff is granted 15 days to file a reply.

This suit, involving about six million dollars, has consumed 12 days of court procedure, but this represents only a fraction of the expenditure of money and time required in the preparation of the case. The first activities in anticipation of the case began about three years ago, and its end will not be definitely attained until after the first of the year.

The plaintiffs assert that a Stewart or "third period" vein, apexing in their Foser claim and called by them the Poser vein, extends extra-laterally down under the Badger State claim of the Anaconda Company, and that the defendant company has been mining ore that is a part of this vein. To prove the existence and continuity of this alleged vein and to demonstrate its exact course the plaintiffs introduced five expert witnesses who testified that investigations by them covering a period of 200 days confirmed the Poser vein hypothesis. These witnesses were Albert Burch, mining engineer, of Medford, Oreg.; Dr. Andrew P. Lawson, professor of geology at the University of California; Dr. Warren J. Mead, professor of geology at the University of Wisconsin; W. A. Simpkins, mining engineer, and George W. Rodewig, superintendent of the Elm Orlu mine.

The case of the defendants was expressed in specific and categorical contradiction of the primary claims of the plaintiffs. They denied first of all the existence of a Poser vein or any vein of the Stewart or "third period" system in the region in controversy. The defense declared that the course of what the plaintiffs called the Poser vein to be identified at the east end of the Poser claim with the Pilot vein. Supporting the defense's case was a corps of mining experts including Reno H. Sales, chief geologist for the Anaconda Copper Mining Co.; Samuel Barker, Jr., mining engineer, of Butte; Chester Steele, geologist and engineer who has been in charge of the development work at the Badger mine for the last ten years; F. A. Linforth, geologist with the defendant company; Dr. Alan Bate-man, professor of economic geology at Yale University and consulting engineer for the Kennecott Copper Co., and Walter Wiley, mining engineer.

TAX REDUCTION ON SILVER APPROVED IN MEXICO

The President of Mexico has approved a decree providing for a progressive diminution of silver taxes when the price of that metal falls below 57 cents per ounce, states a cable to the Department of Commerce from Acting Commercial Attache George Wythe, Mexico City. The average price for October on the New York Market was 54.505 cents per Troy ounce, as compared with 71.106 for October, 1925. The constant rise of dollar exchange is reported to be exerting an adverse effect on markets and collections in Mexico.

Another attempt is to be made at the next session of the Pennsylvania legislature to repeal the anthracite tax law. Many of the candidates in the recent election were said to have been in favor of such action.

Wages in the Coal Industry

According to a statement by D. C. Kennedy, secretary of the Kanawha Coal Operators' Association, operators in the Kanawha field have paid out from January 1 to October 16 of this year a total sum in wages of \$15,473,846.30. Wages in all of the districts of West Virginia are now on a very high level and are about equal to those paid in 1922. Further increases are said to range from anywhere from 20 to 50 percent.

Indiana Mines Busy

According to a statement from the officials of the United Mine Workers of America, approximately 80 percent of the mines in Indiana are now working full or part time. They also state that 75 percent of the number of miners who manned the Indiana mines during the World War are now at work.

Fairmont District Adopts New Wage Scale

A new wage scale which will be known as the Fairmont scale was recently adopted following a unanimous agreement between delegates of 14 employes associations of the Consolidation Coal Company and the representatives of the company. This scale provides for an increase of about 20 cents per ton on the mining rate and of about \$2.12 a day to men paid by the day or an increase of from \$4.60 to \$6.72. At a conference between all of the larger non-union companies in northern Western Virginia, it was agreed to put the same scale into effect beginning November 1.

Labor Conditions in Pennsylvania Mining Districts

Coal mining activities have been spurred on by the arrival of cold weather, according to reports from the offices of the Pennsylvania State Employment Bureau of the Department of Labor and Industry published by Anthracite Bureau of Information. In both anthracite and bituminous regions the demand for coal is large and in the anthracite mines there are capacity forces at work.

The reports for the two-week period ending November 15 show:

Anthracite—Scranton: Throughout this entire district all of the coal mining companies are operating to capacity, producing record tonnage. There is an upward trend in employment. The supply of available miners and loaders is adequate, but there is a shortage of maintenance workers.

Bituminous—Pittsburgh: The reopening of a number of mines in this district, together with the general renewed activity along this line, has afforded employment for many miners, some of whom were employed on other work during the period of their lay-off. There are very few miners in this district seeking employment at the present time.

Johnstown: Activities in coal mining are still on the increase. The demand for miners is entirely beyond the ability of anyone to fill at the present time. The miners, taking advantage of the present condition, seem to be able to command such wages and working conditions as suit them.

Altoona: The coal industry in the Altoona district continues active. There has been a slight reaction in prices since the first week of the month, due to congested conditions at the piers.

Increased Miners Wages

Operators in the Kanawha District posted notice of a wage increase effective November 1 which increases the rate for motormen and machine runners from \$4.64 to \$7.18 per day and trappers from \$2.57 to \$3.65 per day. Coal loaders were advanced from 43 cents to 63 cents per ton and cutters from 10 cents to 14 cents per ton. The Valley Camp Coal Company has also announced increase in wages approximating 30 per cent to 3,000 of its men.

Mine Labor Survey

P. H. Moncure, special agent of the Federal Bureau of Labor Statistics, will make a survey of coal mine labor statistics in Colorado. The study will deal with the number of hours the miners work and their wage scales.

Metal Production in Eastern States

The mention of gold, silver, copper and other metals is apt to bring first to mind the richly mineralized mountain ranges of the Western states, but considerable amounts of these metals are produced annually in the Eastern States, according to the Bureau of Mines. For instance, more than \$50,000,000 worth of gold was produced in the southern Appalachian States during the period 1799 to 1925. The mine production of gold, silver, copper, lead and zinc in the Eastern States in 1925 was valued at \$22,068,792, which is 11 percent more than the corresponding value in 1924. Of this total value gold represented \$40,612, silver \$73,722, copper \$2,957,016, lead \$465,798, and zinc \$18,531,644. The mine production of all metals increased in quantity and value, and the larger lead, zinc, and copper mines were operated steadily to take advantage of the higher prices for those metals in 1925. The quantity of ore treated increased 16 per cent.

The value of the output of gold in the Eastern States in 1925 was the greatest since 1916. The increased production in 1925 as compared with 1924 was due largely to two deep mines, one at Villa Rica, Ga., and one at Reidsville, N. C. The deep and the placer gold mines, from which has come nearly all the gold produced in the Eastern States, supplied 70 per cent of the gold in 1925 against only 32 per cent in 1924. Placers yielded only \$246, siliceous ores \$28,045, and copper and magnetite ores \$12,321. The output of siliceous ores, most of which came from two properties, increased considerably, and the recovery of gold from them was \$22,927 larger than in 1924. Gold mining in most districts was no more active in 1925 than in 1924, and except at two or three properties little capital went into development. Mining costs are still too high to attract capital to southern gold mines. The most activity in 1925 was in Douglas and McDuffie Counties in Georgia and in Montgomery and Rowan Counties in North Carolina. None of the gold mines in Alabama or South Carolina was active. The gold obtained in refining copper bullion from Tennessee and Pennsylvania, \$12,321, was slightly more than in 1924.

All of the silver produced in 1925, except 159 ounces from siliceous ore, was derived from copper ore and pyritiferous magnetite ore.

The value of the mine production of copper in the Eastern States in 1925 showed an increase \$409,023 compared with 1924. All of the output was derived from copper ore from three mines in Tennessee and from copper concentrates recovered from Pennsylvania pyritiferous magnetite ore. The quantity of ore treated to produce this copper was 1,611,

509 short tons. Exclusive of the magnetite ore, which was mined for its iron content and contained little copper, the average yield from copper ore was about 1.25 per cent, or 24.9 pounds to the ton; this copper ore also yielded \$0.10 in gold and silver to the ton. The copper concentrates from magnetite ore contained about 2.95 per cent copper and a small

quantity of gold and silver. Copper ore directly smelted amounted to 452,864 tons, from which about 11,425,256 pounds of copper was recovered. Copper and magnetite ores concentrated amounted to 1,158,645 tons, which yielded 63,441 tons of concentrates containing 9,398,802 pounds of copper.

In 1925, as in 1924, the only output of

HOW THE STATES RANK IN MINERAL PRODUCTION

PENNSYLVANIA, with its enormous coal output, led all the States in the production of minerals in 1924, the latest year for which complete figures are available, according to the Bureau of Mines. The commonwealth's mineral production in that year amounted to \$1,011,630,879 and constituted 21.64 percent of the nation's entire mineral output. In addition to coal, the State was a large producer of cement, clay products and natural gas. California ranked second as a mineral producing State, its tremendous production of petroleum, natural gas, cement and natural-gas gasoline comprising the bulk of its mineral output valued at \$428,175,652. Oklahoma, with production valued at \$393,030,665, made up largely of petroleum, zinc, natural gas and natural-gas gasoline, ranked third.

West Virginia, whose coal, natural gas, petroleum and clay products constituted the bulk of its mineral production valued at \$307,314,205, ranked fourth. Texas was the fifth State, its production valued at \$272,729,023, being largely comprised of petroleum, sulphur, natural-gas gasoline and natural gas.

The relative rank of the other States, with the minerals constituting the bulk of their production, is indicated in the following table:

Ohio	Clay products, coal, natural gas, petroleum.....	\$249,049,648
Illinois	Coal, clay products, petroleum, cement.....	235,796,027
Kentucky	Coal, petroleum, clay products, natural gas.....	120,510,775
Michigan	Iron ore, copper, cement, clay products.....	114,239,386
Indiana	Coal, cement, stone, clay products.....	112,299,075
Minnesota	Iron ore, cement, stone, clay products.....	107,844,680
Kansas	Petroleum, zinc, coal, natural gas.....	105,005,476
Arizona	Copper, gold, silver, lead.....	100,325,413
New York	Clay products, gypsum, cement, stone.....	95,435,299
Utah	Copper, lead, coal, silver.....	84,356,626
Missouri	Lead, clay products, cement, coal.....	81,054,122
Alabama	Coal, iron ore, cement, clay products.....	77,315,753
Wyoming	Petroleum, coal, natural gas, natural-gas gasoline...	75,494,166
New Jersey	Clay products, zinc, cement, sand and gravel.....	75,271,009
Montana	Copper, silver, coal, zinc.....	70,631,806
Arkansas	Petroleum, coal, natural gas, bauxite.....	61,748,999
Colorado	Coal, gold, clay products, lead.....	61,487,882
Louisiana	Petroleum, sulphur, natural gas, natural-gas gasoline..	56,930,681
Iowa	Coal, cement, clay products, gypsum.....	40,459,869
Virginia	Coal, clay products, stone, cement.....	37,962,143
Tennessee	Coal, cement, clay products, stone.....	35,354,525
Idaho	Lead, silver, zinc, gold.....	27,331,623
Nevada	Copper, silver, gold, gypsum.....	26,225,943
New Mexico	Copper, coal, zinc, silver.....	23,913,523
Washington	Coal, cement, clay products, stone.....	21,159,370
Maryland	Cement, coal, clay products, sand and gravel.....	18,506,867
Alaska	Copper, gold, coal, silver.....	17,361,384
Wisconsin	Stone, sand and gravel, lime, iron ore.....	15,796,720
Massachusetts	Stone, clay products, lime, sand and gravel.....	15,725,882
Georgia	Clay products, stone, cement, Fuller's earth.....	14,946,610
Vermont	Stone, slate, lime, talc.....	14,549,429
Florida	Phosphate rock, stone, Fuller's earth, sand and gravel.	13,101,223
North Carolina	Clay products, stone, sand and gravel, feldspar.....	9,261,467
Connecticut	Clay products, stone, sand and gravel, lime.....	8,129,332
Oregon	Cement, stone, sand and gravel, clay products.....	7,864,232
South Dakota	Gold, stone, sand and gravel, silver.....	6,884,433
Maine	Stone, lime, clay products, slate.....	6,035,160
South Carolina	Stone, clay products, sand and gravel, calcareous marl	3,444,366
New Hampshire	Stone, clay products, sand and gravel, feldspar.....	3,378,165
Nebraska	Sand and gravel, cement, clay products, stone.....	3,209,426
North Dakota	Coal, clay products, sand and gravel, tungsten ore...	2,776,720
Mississippi	Sand and gravel, clay products, stone.....	2,090,422
Rhode Island	Stone, clay products, lime, sand and gravel.....	1,132,641
District of Columbia	Sand and gravel, clay products, sand lime brick, stone	813,608
Delaware	Stone, clay products, sand and gravel.....	512,105

lead in the Eastern States reported to the Bureau of Mines was made by mines in Tennessee and Virginia. The quantity of lead recovered was 5,354,000 pounds, or 21 per cent more than in 1924.

Zinc ore mined in New Jersey in 1925 was 606,177 short tons, in Tennessee 914,373 tons, and in New York, 47,254 tons.

All of the zinc ore from Tennessee and New York went to concentrating plants and of the zinc ore from New Jersey about 390,000 tons was concentrated. In Virginia 120,459 tons of lead-zinc ore was concentrated, yielding both lead and zinc concentrates.

The recoverable zinc in the ore mined in New York in 1925 was 10,316,000 pounds, in Tennessee 32,512,000 pounds, and in Virginia 5,464,000 pounds.

Further details are given in the Bureau of Mines publication "Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1925," by J. P. Dunlop, which may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 5 cents.

Antimony Production in 1925

In 1925, domestic mines produced 123 short tons of crude antimony ores containing 33 tons of metallic antimony, according to J. W. Furness, mining engineer, Bureau of Mines. Some shipments were also made from accumulated stocks of ore mined in Nevada in 1917 and 1918. One smelter in the United States reported a small production of metallic antimony from foreign ore.

The general imports of antimony metal or regulus during 1925 amounted to 10,659 short tons, valued at \$2,513,420. This represents an increase in quantity of 3,383 short tons and in value of \$1,612,502 as compared with 1924 importations. Approximately three-fourths of these importations were from China, with the bulk of the remainder from Germany and the United Kingdom. The reexports of matte, regulus or metal were 94 tons. Importations of antimony ore amounted to 1,359 short tons with an antimony content of 773 short tons, valued at \$47,084. The bulk of these importations came from Bolivia, Mexico and Chile. Stocks of metallic antimony in bonded warehouses on January 1, 1926, were 241 tons. The production of antimonial lead from domestic ore in 1925 was 14,472 tons, which contained 1,972 tons of metallic antimony. In addition to the imports of metallic antimony, 3,005 tons of type metal and antimonial lead, containing 850 tons of metallic antimony, were imported. By-product antimonial lead produced in the United States from both foreign and domestic ores in 1925 amounted to 19,667 short tons, with an antimony content of 2,624 short tons valued at \$918,400.

During the year 10,840 short tons of

antimony, valued at \$3,794,000, were recovered from old alloys, scrap, and dross. All but one ton was recovered in the form of alloys; 1,328 tons were recovered from antimonial lead scrap treated at regular smelters, and 9,512 tons were recovered as metal and in alloys reported by secondary smelters.

About 50 per cent of the world's production of antimony finds its way into the United States, and in times of peace 75 per cent of the imports are utilized in the manufacture of type metal, antifriction bearings for machinery, britannia metal, and hard metal (antimonial lead). Of the 30 odd uses to which antimony is put, virtually all can be taken care of satisfactorily by substitutes, many of which are on a stronger industrial footing than antimony and its alloys; as an example, in the hardening of lead either calcium, barium, strontium, magnesium, or copper may be used. Alloys of barium and calcium successfully compete with antimonial alloys as bearing metals. Antimony is used as a pigment and as a mordant, but many metals can be used satisfactorily in its place. Antimony does not seem to possess any characteristics that make it irreplaceable. Broadly speaking, it is a cheap metal which can be used as a substitute for more expensive metals, and in many uses it replaces them.

Detailed statistical information in regard to the antimony situation is given in Bureau of Mines publication "Antimony in 1925," which may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 5 cents.

Production of Native Asphalt and Related Bitumens

Kentucky, in 1925, maintained its rank among the states as the chief producer of native asphalt, with sales of 286,850 short tons of bituminous rock, valued at almost \$2,500,000, according to recent statistics. Texas, with 204,530 tons of bituminous rock, was second in quantity, a position that it held in 1923 and 1924. As in 1923 and 1924, Utah was the only state to produce bitumens other than bituminous rock, and sales of 39,520 tons of gilsonite and 270 tons of wurtzilite, valued at \$767,900 and \$18,400, respectively, were reported. An increase in output and in the average value of its products enabled Utah to pass Texas and to resume its rank as second to Kentucky in total value.

Detailed information in regard to the asphalt industry in the United States is contained in the Bureau of Mines report "Asphalt and Related Bitumens in 1925," by G. R. Hopkins and A. B. Coons, which may be obtained from the Superintendent of Documents, Washington, D. C., at the price of 5 cents.

No commercial production of grahamite and ozokerite was reported in 1925.

Bauxite in United States

The bauxite deposits of the United States are in central Arkansas, northeastern and southeastern Alabama, northwestern and west-central Georgia, northeastern Mississippi, and eastern Tennessee, states the Bureau of Mines in a recently issued report. The bauxite from all localities in the United States, though it may vary in chemical composition, is on the whole similar in general appearance, with the exception of the "granitic bauxite" of the Arkansas field. The greater part of the American bauxite appears to be made up of rounded pebblelike bodies set in a fine-grained matrix, which may also consist of small rounded particles or may be as fine-grained as the finest clay. The pebble or pisolite form is so general that it is the conspicuous characteristic of American bauxite.

There is only one way to determine the value of bauxite, and that is by chemical analysis, which should show total silica, alumina, titanium oxide, iron oxide, and water. Bauxites of commercial grade should carry at least 52 per cent of alumina.

Some measure of the relative quality of dried bauxite can be had by grinding a sample in an agate mortar for half a minute. A bauxite of good grade will be found hard to grind and will stick to the mortar with such tenacity that it will have to be scoured out; a poor bauxite or bauxite clay will grind much more easily and will stick very little, if at all; and clay or kaolin grinds with ease and does not stick to the mortar. Similar results are found if the sample is rubbed on glass; the glass will not be scratched by even high-grade bauxite.

Bauxite finds its market east of the Mississippi River, and is sold largely to the manufacturers of aluminum, abrasives, commercial chemicals, and refractories. In 1925 the market for the manufacture of the alumina cements was largely met by imported bauxite. High-alumina (diaspore) clays produced in Missouri are being sold according to their alumina content, and three grades, containing 55, 65, and 70 per cent of alumina, are regularly handled. In the last few years some of the makers of refractories and of aluminum chemicals have been using clays as a crude material in place of bauxite.

The total production of bauxite in the United States from the beginning of the industry in 1889 through 1925 was 6,045,394 long tons, valued at \$33,513,987. The quantity produced in the period 1889 to 1895, inclusive, was 0.9 per cent of this total, and for the period the average value f. o. b. mines was approximately \$3 a ton. In the following decade, 1896 to 1905, 5.2 per cent of the total was produced and the average value was

about \$4; in the next decade, 1906 to 1915, 25.5 per cent was produced with an average value of about \$5; and in the last decade, 1916 to 1925, 68.4 per cent with an average value of about \$6.

The largest consumers of bauxite in the United States are also producers, and there is only a small market for what might be called "outside bauxite." Consumers who do not own deposits contract for their supplies for considerable periods, seemingly to assure an adequate supply of bauxite of the grade desired. The price of bauxite at mines or shipping points in 1925, as reported by independent producers, ranged from \$5 to \$6.41 a ton; the average price reported by all producers for the year was \$6.28 a ton f. o. b. mines. Consumers, on the other hand, report prices that average \$12.50 a ton f. o. b. plants, a little lower than in 1924.

Crushed bauxite was quoted at \$5.50 to \$8.50 a ton throughout 1925. Dried and pulverized bauxite was quoted at \$14, and calcined bauxite at \$19 to \$20 a ton f. o. b. shipping point. French and Adriatic bauxite was offered at \$4 to \$7 and Guiana at \$8.50 c. i. f. American ports.

Under the tariff act of 1922 crude bauxite is dutiable at the rate of \$1 a ton, and alumina hydrate or refined bauxite at half a cent a pound.

Detailed information in regard to the bauxite and aluminum situation is contained in the Bureau of Mines publication "Bauxite and Aluminum in 1925," by James M. Hill, which may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 5 cents.

Ferromanganese in 1926

Indications now are that the 1926 production of ferromanganese will exceed any peace-time record and fall not far short of the largest quantity ever made in any one year. According to returns by blast furnaces to The Iron Age, there were 252,298 tons made to November 1, this year, and if the rate of output is maintained for the balance of the year, the 1926 total will approximate 305,000 tons. A comparison of this with other years is as follows, the data being that of the American Iron and Steel Institute:

1926	305,000 (est.)
1925	260,029
1924	194,243
1923	247,031
1922	150,115
1920	295,447
1918	333,027

It will be seen that 1926 will easily rank second and that for peace-time years the next best having been 295,447 tons in 1920. The war record of 333,027 tons in 1918 will stand as the largest in any event.

The Antimony Situation

Antimony is found in many localities throughout the world, states the Bureau of Mines in a recently issued report. Little is known as to the actual world resources, as heretofore the supply has met the demand with ease and resources have never been taxed to their maximum capacity. For many years France was the only country requiring any considerable quantity of antimony that obtained it from her domestic deposits; but with the economic exhaustion of La Lucette mine, in the Province of Mayenne, production in France has virtually ceased. Some of the needs of France are now supplied by Algeria (French owned). From what is now known of the resources of the British Empire, Burma is the only country that may supply a material part of Great Britain's consumption at a price greater than has heretofore been reached. The inaccessibility of the Burmese deposits makes them noncommercial at present.

Among the countries that utilize a large share of the world's output, the United States, Germany, Japan, Spain and Italy do not contain deposits of antimony of such size as to be of commercial importance. Of the deposits now developed, those of China, Bolivia and Mexico are large enough to guarantee the world's present annual consumption for many years. Of these countries China occupies the strategic position through ability to control, within limits, the world's output as well as the price. This statement does not mean that China can exercise what to the balance of the world would be an onerous control of prices, but that her costs of production are such as to enable her to eliminate production from other countries. The very nature of the uses of antimony renders the maintaining of a high price for the metal extremely difficult, if not impossible. High prices mean substitution and curtailment of consumption; also when the price of antimony is in excess of 15 to 17 cents per pound (New York quotation) Bolivia and Mexico begin to produce the metal and thus create a surplus that inevitably results in lower prices.

From the standpoint of the consumer of antimony in the United States, it would seem that for many years domestic needs will be supplied from China at a price range which heretofore has resulted in a domestic consumption of about 6,500 tons of metallic antimony per annum. Should prices rise higher, it is to be expected, from present knowledge of the world's reserves, that history will repeat itself; overproduction will result and prices will revert to the range at which the world's demand has heretofore been supplied.

Iron Ore Shipments to Nov. 1

According to the American Metal Market, iron ore shipments from Lake Superior district for October were 9,337,463 tons against 7,004,443 tons last year, a new high record. Shipments of Oliver Iron Mining Co., a U. S. Steel Corporation subsidiary, from Duluth, Missabe & Northern docks at Duluth were 2,938,229 tons, against 2,131,309 tons last year, and independents shipped 2,360,016 tons against 1,601,659 tons.

For the season to November first, 54,568,371 tons of ore were shipped, against 49,816,469 tons last year. Duluth, Missabe & Northern docks led with shipments of 17,298,676 tons, against 16,426,156 tons last year. Great Northern docks were second with 13,799,732 tons, against 12,280,677 tons last year, and the Duluth & Iron Range Railroad docks were third with shipments of 5,938,289 tons, against 5,628,525 tons last year. Mining interests here think that ore shipments for the season will be more than 58,000,000 tons, against 54,098,492 tons last year.

Oliver Iron Mining Company has arranged for a heavy stripping program during the winter in the Hibbing district. At the old Hibbing town site a large area of the overburden is expected to be moved. It is understood that the Oliver and the other mining companies have been operating every mine that was profitable during the present season. The crushing plant of the Oliver interests at Hibbing is making it possible to utilize much hitherto untouched low-grade ore.

North Carolina Produces Some Gold

The value of the gold produced in North Carolina during the period 1799 to 1925 was \$23,658,441, according to the Bureau of Mines. The yield of gold increased from \$4,540 in 1924 to \$18,540 in 1925, although very few mines were active, and the increase was due entirely to work at the Rich Cog mine at Reidsville, in Montgomery County. This mine is opened by an inclined shaft 550 feet long. The 50-stamp mill is equipped with seven Wilfley tables and the ore is treated by amalgamation. The concentrates have been saved for treatment by cyanidation, but no gold was recovered from them in 1924 or 1925.

The Gold Hill mine at Gold Hill, in Brown County, was operated by the South Gold Hill Mines Co. Four test runs at the 10-stamp mill yielded some gold, by amalgamation, for shipment. A large amount of drifting was done on four gold-bearing veins in 1925. The small output of placer gold, \$178, was from McDowell and Rowan Counties; the placer mines in Burke and Rutherford Counties did not report any output. None of the deep gold mines in Cabarrus, Moore, Davidson, or Guilford Counties was worked in 1925.

Arsenic Production in 1925

Only by-product arsenic plants belonging to three smelting companies and one mining company were producing white arsenic in the United States during 1925, according to the Bureau of Mines. These plants are situated at Tacoma, Wash., Globe, Colo., Perth Amboy, N. J., Midvale, Utah, and Anaconda and Jardine, Mont. At the Jardine plant, which is connected with amalgamation and cyanidation works, arsenic is recovered as a by-product in the treatment of arsenical gold ores. All of these plants were built or were enlarged in 1923 when the demand for arsenic was the greatest, and no increase in the total quantity of ore treated was necessary to enable the imported and domestic supply to fill consumers' demands in the United States. About half of the arsenic produced came from the smelting of lead ores, the other half from copper smelting plants and from the Jardine gold mill. The chief sources of domestic arsenic were Utah and Montana, where it was recovered from miscellaneous ores and concentrates by the American Smelting & Refining Co., the United States Smelting, Refining & Mining Co. (Inc.), the Anaconda Copper Mining Co., and the Jardine Mining Co.

The only companies which produced ore that was sold in 1925 for its arsenic content were the Western Utah Copper Co., and the United States Smelting, Refining and Mining Co., at Gold Hill, Utah. This ore, little of which was mined in 1925, was shipped to the smelters and stock piled for future treatment. The output of arsenical ore of the Gold Hill mines decreased from 35,444 tons in 1924 to 3,045 tons in 1925. The Western Utah Copper Co. also shipped monthly an average of about 1,000 tons of lead-silver ore containing a little arsenic and considerable iron to the lead furnaces at Murray, Utah. Experimental work in the manufacture of weed killer and Paris green from fume recovered from a 2-ton roasting plant at Sapinero, Colo., was reported by the White Iron Ores & Products Co.

Detailed information in regard to the arsenic situation is contained in a Bureau of Mines publication "Arsenic in 1925," by V. C. Heikes, copies of which may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 5 cents.

Production of Zinc in New York

The quantity of zinc ore mined in New York in 1925 was 47,254 short tons, and the concentrates shipped yielded about 19,316,000 pounds of zinc, according to J. P. Dunlop, statistician, Bureau of Mines, in a recently issued report.

The Brown mine of the New York Zinc Co., near Edwards, St. Lawrence County,

was worked steadily through two shafts, one 960 feet deep, the other 1,560 feet deep. Ore, in limestone, was mined at various levels, the lowest at 1,200 feet. The 1,560-foot three-compartment shaft was completed in 1925, and an aerial tramway 3,000 feet long was erected to carry concentrates from the mill to the railroad. The ore mined is concentrated, then treated on Weatherby electric separating machines. The zinc concentrates, which carry almost 45 per cent zinc, are shipped to smelters, and the pyrite recovered is mainly sold to pulp mills.

Gold Production in Georgia

The value of gold produced in Georgia during the period 1830 to 1925 was \$17,840,057, or more than one-third of the estimated total output of the Southern Appalachian States, according to the Bureau of Mines. In 1925 four deep mines and one placer mine produced \$9,683 in gold and 46 ounces of silver. The production of gold in 1924 amounted to only \$655. Of the 1925 output only \$68 was from placer mining; it was from a small property in Douglas County. None of the placer mines in Lumpkin and White Counties was worked. The largest producing deep mine in Georgia was the Pine Mountain, at Villa Rica, Douglas County.

Where Feldspar Comes From

A considerable part of the supply of feldspar annually available for the ceramic and other feldspar-consuming industries in the United States is mined in Canada. According to reports of the Dominion Bureau of Statistics the Canadian shipments—all from Ontario and Quebec—amounted in 1925 to 23,189 long tons, valued at \$214,479, or \$9.25 a ton, a decrease of 42 percent in quantity and 40 percent in value compared with 1924. The sales of Canadian spar ground in the United States in 1925 constituted 13 percent of all ground spar sold in this country in that year, a proportion about the same as that for several years preceding.

Besides the United States and Canada, Germany, Norway, and Sweden are the chief producers of feldspar. Although the United Kingdom has an immense pottery industry, it appears to be a small producer of feldspar. Cornwall stone rather than feldspar is extensively used as a flux in the British pottery industry.

Further details regarding the feldspar industry in this country and abroad are contained in the Bureau of Mines publication "Feldspar in 1925," by Jefferson Middleton, which may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 5 cents.

Investigation of Low-Grade Bauxite

In the investigation of the beneficiation of low-grade bauxite being undertaken by the Southern Experiment Station of the Bureau of Mines, Birmingham-Tuscaloosa, Ala., the bauxites will be considered as being of two types, namely: High silica bauxites and high iron bauxites. Material of the first-named class has been obtained from Colbert County, Ala., and of the last-named class from Cherokee County in the same state. In the case of most high silica bauxites, the main difficulty will be to separate the clay from bauxite minerals. In attempting to work out this problem float-and-sink tests will be made on various screen-sized products, to determine the degree of crushing which will be required to liberate the mineral from the gangue. The washing out of the clay after crushing will very likely involve the use of peptizers for dispersing the clay so as to keep it in suspension as there is not enough difference in specific gravity between gangue and mineral to permit the use of ordinary methods of gravity concentration. In the case of the high iron bauxite, it may be found possible to remove a large proportion of the iron minerals by tabling and other gravity methods. A series of float-and-sink tests will be made to determine whether or not such methods will be practicable.

The problem of finding a satisfactory dispersing reagent for the clay contained in bauxite has been assigned to one of the University of Alabama fellowship men cooperating.

The float-and-sink work has been assigned to two fellowship men, with one investigating the high silica bauxite, and the other the high iron bauxite. Upon completion of this preliminary work, an attempt will be made to apply in a practical way, by means of laboratory machines, the information obtained from preliminary tests.

Increased Imports of Pyrites

For the first time since 1920 importations of pyrites into the United States will exceed the 300,000 ton mark. The official figures for the first nine months show entries of 289,877 long tons, which in itself is more than has been received in any full year period since 1920.

Statistics covering exports of brimstone from the United States during the first nine months of 1926 disclose that there has been a decline in shipments to foreign markets. Export shipments, however, of 629,401 tons in 1925 were exceptionally large. In the first nine months of the current year 412,979 tons were exported in comparison with 469,919 tons during the parallel period of 1925.

Number and Size of Commercial Bituminous Coal Mines in 14 States, 1925

As a part of its statistical service to the coal industry, the Bureau of Mines collects figures of the number and size of mines in operation. Figures for 1925, comparable with those for earlier years, are being published state by state as fast as the returns from operators can be checked and tabulated. Fourteen states have been completed and in response to many requests, the figures are summarized below. The figures for Pennsylvania are subject to slight revision.

The statistics relate to commercial mines, and exclude "wagon mines." The workings excluded under this general term embrace very small country coal banks, and "fly-by-nights" that open only in periods of very high prices. In the Appalachians thousands of these fly-by-nights opened during the periods of high spot prices in 1917, 1920, and 1922, only to close when prices fell again. Although a great many of these mushroom-like mines ship coal in railroad cars, they are commonly referred to as "wagon mines."

The term commercial mines, on the other hand, includes all properties listed by the Bureau of Mines that have produced as much as 1,000 tons for several years running, and therefore includes numerous mines whose product is not shipped but is sold locally.

The figures for each year in the table count only the mines that produced coal in that year.

Number of Bituminous Coal Mines of Commercial Size That Produced Coal in 1923, 1924, and 1925, in Fourteen Representative States.

State	1923	1924	1925
Colorado	236	231	229
Illinois	575	488	466
Indiana	301	248	203
Iowa	*151	256	207
Kentucky	663	496	480
Kentucky (East)	172	164	161
Maryland	105	93	88
Montana	*48	65	62
New Mexico	42	42	38
Ohio	906	750	639
Pennsylvania (prel. figures)	2,868	2,122	1,974
Tennessee	191	139	112
Utah	37	39	41
Washington	56	58	56
West Virginia	1,666	1,220	1,173

Total 14 states..... 8,017 6,414 5,919

* Figures for 1923 incomplete, which accounts for the apparent increase in 1924.

These figures are comparable for the three years (except as noted for Iowa and Montana) and there can be no mistaking the general tendency of the number of mines to fall. For the fourteen states, the total dropped from 8,017 commercial mines in 1923 to 5,919 in 1925.

The first table, however, takes no account of the size of the mines and it is therefore interesting to compare the number of the large mines of "Class 1" in the size classification used by the Bureau, namely, mines that produced 200,-

000 tons or more in the year. This is done in the table following.

Number of Class 1 Mines (Those Producing 200,000 Tons or More) and Per Cent That They Contributed to the Total Production of all Commercial Mines in the State, 1923 and 1925.

	No. of Mines		Per Cent of Total Output of Commercial Mines	
	1923	1925	1923	1925
Colorado	15	13	37.6	36.4
Illinois	134	96	74.9	82.4
Indiana	48	36	59.5	62.7
Iowa	4	5	22.2	31.8
Kentucky	36	70	25.9	41.0
Maryland .....	...	3	...	25.7
Montana	4	4	64.0	65.3
New Mexico	2	2	20.9	28.6
Ohio	58	34	40.7	42.0
Pennsylvania (Prel. figures)	247	281	54.0	67.0
Tennessee	3	4	13.1	18.5
Utah	10	10	60.7	66.5
Washington	4	4	36.6	42.1
West Virginia	122	194	34.5	52.0

In order to make them strictly comparable with 1925 the percentages for 1923 in this table are calculated from the total number of tons produced by the commercial mines not including the wagon mines canvassed in that year.

It is noteworthy that in Illinois, Indiana, and Ohio, there was a decline from 1923 to 1925 in the number of mines that reached the 200,000-ton mark, associated with the marked decline in total production which was occurring in those states. The decline was evidently greatest in the smaller mines, however, for the per cent of the state total contributed by the Class 1 group actually increased.

In some of the other states, on the other hand, notably West Virginia and Kentucky, there was a large increase in the number reaching the 200,000-ton mark associated with the increase in total production which was occurring in these states. For these states the per cent contributed by the Class 1 mines very greatly increased.

In Pennsylvania the number of Class 1 mines increased somewhat and the per cent contributed by them increased slightly.

Annual Meeting Illinois Mining Institute

The annual meeting of the Illinois Mining Institute was held at Harrisburg, Ill., November 12 and 13. Edward Coulehan, superintendent of the Saline County Coal Corporation, Harrisburg, was chairman of the committee on arrangements.

Coal Mining Institute Pittsburgh Meeting

The annual meeting of the Coal Mining Institute of America will be held at Pittsburgh, Pa., December 8, 9, and 10.

Smokeless Operators Meet

The annual convention of the Smokeless Operators' Association of West Virginia will be held at the Waldorf Hotel, New York City, December 2. A special luncheon will be tendered those in attendance, according to E. J. McVann, secretary of the association, Washington, D. C.

Ohio Operators Consider Coal Depression

At a meeting of the Ohio Chamber of Commerce its coal mining committee agreed to secure the salient facts concerning the plight of the industry. Mine operators and the public will be asked to send representatives to the various conferences which will be arranged to present their views. The first hearing was scheduled for Steubenville, Ohio. It was the consensus of opinion that the present resumption of operations in the coal field is only temporary and in no sense solves the situation. Samuel S. Wyer, chairman of the mining committee, insisted that the solution must be permanent and one not momentarily advantageous. Mr. Wyer, stressed the public's dependence on coal and pointed out that all of the coal miners in the United States represent but three-fourths of one percent of our total population. Among the factors which he felt the committee might well deal with were overdevelopment of the coal industry, more complete mechanization of the mines through the installation of labor saving equipment, and freight rates. Mr. Wyer said that there was "no economic Santa Claus," that every man's service that is paid for must come from some other man's money. He summarized Ohio's present position as follows:

1. While Ohio's coal production is scattered through 27 counties, 90 per cent is concentrated in eight counties.

2. The total coal production in Ohio, now less than 5 per cent of the nation's total is of no consequence as far as the nation as a whole is concerned and no national interests are, therefore, involved as to whether the Ohio mines work or whether they do not work. The nation can get along without Ohio coal.

3. What we are facing here, therefore, is not a coal mining problem but a sociological problem as to what to do with the large number of unemployed men in the Ohio coal industry. A part of the task will be to help these miners find themselves, economically speaking, and assist them in making the necessary adjustments in getting into other lines of work where there is a need for their services.

4. Some Ohio coals are of lower quality than most of the competing coals in the contiguous states and this quality handicap must be reckoned with in any plan to revive the industry. To state the situation bluntly, much Ohio coal is worth less and it takes more for a given service than some of its competitors.

5. As an offset to the quality situation, Ohio's coal is closer to its markets than its competitors, and, therefore, should have this advantage in freight cost.

6. Coal is sold on the basis of cost and value and not on the basis of sentiment, state pride, or emotional appeal. Both the operator and the miner must square

off to this fundamental fact if a working relationship is to be developed that will permit the operation of the Ohio mines in competition with the mines of contiguous states.

Mr. Wyer, in outlining what the committee can do, summed it up under three main heads, as follows:

1. To get the salient facts of Ohio's coal problem together and in a form that the facts can be assimilated by the public.
2. From these facts deduce what ought to be done in the situation.
3. Try to get the miners and operators together on a working basis that will be in the public's interest.

Tri-State Organization Elects Officers

At a meeting of the Tri-State Zinc and Lead Ore Producers Association held recently at Picher, Okla., J. F. Robinson, of Miami, Okla., president of the Commerce Mining and Royalty Co., was reelected president. The newly elected vice-presidents are C. F. Dike, manager of the Oklahoma Wood Chuck Co., and Sidney H. Davis, manager of the Vinegar Hill Zinc Co., Baxter Springs, Kans. The following directors were selected: P. B. Butler, O. W. Bilharz, George O. Pearson, H. W. Harrison, F. H. Kisseling, T. F. Coyne, S. H. Davis, J. H. Robinson, C. F. Dike, George Provine, Charles A. Neal, Frank Childress, W. T. Landrum, M. F. Owens, and C. Y. Semple. Julian D. Conover was reelected secretary.

National Safety Council Meets

More than 5,000 delegates attended the annual meeting of the National Safety Council at Detroit, Mich., October 25 to 29. The mining sessions of the meeting were exceptionally well attended and brought together representatives of the different mining sections of the United States. W. G. King was elected president and Howard I. Young was appointed chairman of the mining section for 1927.

Bruce C. Yates, chairman of the mining section for 1925-26 attended the meeting as did J. L. Hodgson, manager Phelps Dodge Corporation at Morenci, Ariz. Richard V. Ageton represented the Tri-State District and a paper on "Management" was presented by H. C. Henrie, Copper Queen Branch, Phelps Dodge Corporation. J. W. Reed, director, Department of Safety, Consolidation Coal Company, Fairmont, W. Va., was one of the representatives of the coal industry as was James L. Davidson, Secretary of the Alabama Mining Institute, and C. A. McDowell, of the Davis Coal and Coke Company.

Accidents in Pennsylvania Industries During the First 10 Months of 1926

The Anthracite Bureau of Information says:

"During October, 1926, the Bureau of Workmen's Compensation received reports of 170 fatal and 16,389 non-fatal accidents occurring to workmen during the course of their employment. These brought the total of reported accidents for the first 10 months of 1926 to 1,747 fatal and 148,736 non-fatal injuries. This 10-months' total compared with reports for the corresponding months of 1925 shows an increase in 1926 of 12 fatal accidents and a reduction of 749 non-fatal injuries.

"Although the accident totals for 10 months show but little change from last year, within the individual industry groups, however, some notable changes have taken place. In the construction and contracting industry, fatal accidents reported in 1926 are 33, or 15.6 percent less than last year. Manufacturing industries show a decrease of 3,381 non-fatal accidents, but a 4 percent increase

in fatalities. Because of changed classifications it is impossible to determine accurately the actual change for transportation and public utility companies, but it is estimated that their accident total is 16 percent less than last year. Accidents in retail stores and wholesale houses show considerable increase over last year, due principally to their delivery and truckage service. Here, again, changed classifications between years prevent accurate comparisons, but fatal accidents for this group have increased about 50 percent and non-fatal accidents 25 percent. The coal industries show changes as indicated in the accompanying chart.

"In this connection, it must be remembered that anthracite mines were not in operation during the last four months of 1925 and a higher accident total in 1926 is expected, of course. Also, that there were two mine disasters this year in the bituminous coal fields, one in February and one in August, which account in some measure for the increase in fatal accidents."

	10 months 1926		10 months 1925		Percent change	
	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal
Anthracite	378	24,665	425	21,284	-11.1	+15.9
Bituminous Coal.....	364	17,635	296	18,829	+20.0	-6.3

Accidents From Explosives Used in Metal Mines

An investigation designed to ascertain the safest and most economical explosive for use in metal mines and to determine the best methods of blasting under different conditions is being conducted by the Bureau of Mines in cooperation with the mining companies of the southwestern states.

In metal mines many of the miners work in isolated places and are not supervised at blasting time. Most miners prepare and fire explosives in a safe manner, but occasionally some one becomes careless or forgetful, and disaster results.

Considerable tact and patience are required to introduce new blasting methods or change old customs at any time. The following of custom is nowhere more evident than in drilling and blasting, and the practices in favor at most mines are the outcome of many years' experience.

As a part of the Bureau of Mines program, a study has been made of all accidents from explosives in the mines of Arizona during 1923 and 1924. During these two years about 13,000 men were employed at the mines and between 30,000,000 and 40,000,000 pounds of explosive were used. The results of this study have just been published by the Bureau as Technical Paper 400, by E. D. Gardner, mining engineer.

A study of the accidents described in this paper leads to the following con-

clusions: Most explosives accidents are preventable. The responsibility for the prevention of explosives accidents rests jointly upon the mining companies and the men using the explosive. The companies must properly plan the operations, provided proper equipment, and establish an adequate inspection service, and the men must use care and common sense in handling the explosive. Although safety inspectors can not visit all working places at blasting time, they should make periodical inspections. The companies should formulate plans and rules for the elimination of accidents from explosives and insist that the rules be enforced rigidly at all times. Inexperienced men, even those who do not have to handle explosives underground, should be properly instructed in the hazards of explosives and detonators. If explosives accidents happen frequently at any one place possible modifications of the mining system should be considered, even though each individual accident is due to carelessness or violations of rules. Mining systems should be made as nearly "fool-proof" as possible; and all operations should be conducted in such manner that the opportunities for carelessness to cause accidents will be minimum.

Copies of Technical Paper 400, "Accidents due to Explosives in Metal Mines of the Southwest, as Shown by Records in Arizona," may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

Golden Appointed Service Commissioner

Governor Pinchot, of Pennsylvania, has appointed Christ J. Golden, of Shamokin, Pa., president of the District No. 9, United Mine Workers of America, as public service commissioner. In making the appointment, Governor Pinchot said that he was appointing him "not only because of his wide experience * * * but because he will represent the rights and interests of the plain people. The domination of the majority of the present commission by the public service corporations make it especially important to fill every vacancy by a man who will be actively on the side of the people." Besides heading the district organization of the United Mine Workers, Mr. Golden is chairman of the Tri-District Board and the Anthracite Wage Scale Committee.

Standards on Fire Tests of Materials and Construction

The sponsors for specifications for fire tests of building construction and materials the United States Bureau of Standards, the American Engineering Standards Committee, the Fire Protection Group, and the American Society for Testing Materials, has submitted to the Standards Committee a formal report embodying revised specifications on the above subject. The report and the revised specifications have been accepted by the sponsors who have asked the approval of the American Engineering Standards Committee as a tentative American standard.

Standard on Direct and Alternating Current Fractional Horsepower Motors

The American Institute of Electrical Engineers has submitted to the American Engineering Standards Committee recommendations for a national standard on direct and alternating current, fractional horse power motors. The A. E. S. C. has appointed the following committee to review the report submitted by the sponsor and has appointed J. F. Meyer, United States Bureau of Standards, Washington, D. C., chairman. The personnel of the committee is as follows:

American Institute of Consulting Engineers: P. M. Lincoln, Cornell University, Ithaca, N. Y.; N. J. Neall, 12 Pearl Street, Boston, Mass.; George Gibbs, Pennsylvania Station, New York.

American Institute of Electrical Engineers: J. F. Meyer, United States Bureau of Standards, Washington, D. C.; G. H. Garcelon, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.; A. H. Kehoe, United Elec. Light & Power Co., 130 E. 15th St., New York, N. Y.; A. F. Welch, General Electric Co., Fort Wayne, Ind.; C. L. Kennedy, Holtzer-Cabot Electric Co., 125 Armory St., Roxbury, Mass.; E. B. Paxton, General Electric Co., Schenectady, N. Y.

American Marine Standards Committee: R. A. Beekman, General Electric Co., Schenectady, N. Y.

American Mining Congress: Fred Stone, General Electric Co., Schenectady, N. Y.

American Railway Engineering Association: C. C. Winslow, Michigan Central Railroad, Detroit, Mich.

American Society of Mechanical Engineers: H. R. Sewell, B. F. Sturtevant Co., Hyde Park, Boston, Mass.

Association of Iron & Steel Electrical Engineers: One representative to be appointed.

Bell Telephone Laboratories: A. E. Petrie, Bell Telephone Laboratories, 463 West Street, New York.

Electric Power Club: Representatives to be appointed, approximately five in number.

National Electric Light Association and Association of Edison Illuminating Cos.: L. L. Elden, Edison Electric Illuminating Co., 39 Boylston St., Boston, Mass.; J. A. Johnson, Niagara Falls Power Co., Niagara Falls, N. Y.; L. G. Smith, Consolidated Gas, Electric Light & Power Co., Baltimore, Md.; R. H. Tapscott, New York Edison Co., Irving Place and 15th St., New York; R. H. Woodrow, Brooklyn Edison Co., Pearl and Willoughby Sts., Brooklyn, N. Y.

Underwriters' Laboratories: J. M. Salling, Underwriters' Laboratories, New York.

United States Bureau of Standards: J. F. Meyer, United States Bureau of Standards, Washington, D. C.; A. S. McAllister, United States Bureau of Standards, Washington, D. C.

United States Navy Department: Head of Specification Section, Design Division, Bureau of Engineering. Member: C. S. Gillette; alternate, V. V. Woodward, Navy Yard, New York.

United States War Department: Col. C. A. Seoane, Signal Corps, 39 Whitehall St., New York.

Induction Motors and Machines

The American Institute of Electrical Engineers has submitted to the American Engineering Standards Committee recommendations to cover a national standard on induction motors and induction machines in general. In appointing the reviewing committee the A. E. S. C. has named P. M. Lincoln, Cornell University, Ithaca, N. Y., as chairman and has appointed the following committee:

American Institute of Consulting Engineers: P. M. Lincoln, Cornell University, Ithaca, N. Y.; N. J. Neall, 12 Pearl St., Boston, Mass.; George Gibbs, Pennsylvania Station, New York.

American Institute of Electrical Engineers: P. M. Lincoln, Cornell University, Ithaca, N. Y.; B. F. Bailey, University

of Michigan, Ann Arbor, Mich.; C. W. Kincaid, Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.; H. Maxwell, General Elec. Co., Schenectady, N. Y.; Fraser Jeffrey, Allis-Chalmers Mfg. Co., Milwaukee, Wis.; E. B. Paxton, General Elec. Co., Schenectady, N. Y.

American Marine Standards Committee: R. A. Beekman, General Electric Co., Schenectady, N. Y.

American Mining Congress: Graham Bright, Howard N. Eavenson and Associates, Union Trust Bldg., Pittsburgh, Pa.

American Railway Engineering Association: Sidney Withington, New York, N. H. & Hartford R. R., New York.

American Society of Mechanical Engineers: Charles A. Booth, Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Association of Iron & Steel Electrical Engineers: One representative to be appointed.

Bell Telephone Laboratories: A. E. Petrie, Bell Tel. Laboratories, 463 West St., New York.

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Underwriters' Laboratories: J. M. Salling, Underwriters' Laboratories, New York.

United States Bureau of Standards: A. S. McAllister, United States Bureau of Standards, Washington, D. C.

United States Navy Department: Head of Specification Section, Design Division, Bureau of Engineering. Member: C. S. Gillette; alternate, V. V. Woodward, Navy Yard, New York.

United States War Department: Col. C. A. Seoane, Signal Corps, 39 Whitehall St., New York.

Alternators Synchronous Motors and Machines

The American Institute of Electrical Engineers has been appointed sponsor in the matter of a national standard of the above subject which has been submitted to the American Engineering Standards Committee for approval. C. A. Adams, Harvard University, Boston, has been appointed chairman of the reviewing committee which is composed of the following members:

American Electric Railway Associa-

tion: H. A. Kidder, Interborough Rapid Transit Co., 600 W. 59th St., New York.

American Institute of Consulting Engineers: P. M. Lincoln, Cornell University, Ithaca, N. Y.; N. J. Neall, 12 Pearl St., Boston, Mass.; George Gibbs, Pennsylvania Station, New York.

American Institute of Electrical Engineers: C. A. Adams, Harvard University, Boston Mass.; W. J. Foster, General Electric Co., Schenectady, N. Y.; F. D. Newbury, Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.; E. B. Paxton, General Electric Co., Schenectady, N. Y.; R. B. Williamson, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

American Marine Standards Committee: R. A. Beekman, General Electric Co., Schenectady, N. Y.

American Mining Congress: J. T. Jennings, Philadelphia Coal & Iron Co., Philadelphia, Pa.

American Railway Engineering Association: J. V. B. Duer, Pennsylvania Railroad System, Altoona, Pa.

American Society of Mechanical Engineers: A. J. Brown, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Association of Iron & Steel Electrical Engineers: One representative to be appointed.

Bell Telephone Laboratories: A. E. Petrie, Bell Telephone Laboratories, 463 West St., New York.

Electric Power Club: Representatives to be appointed, approximately five in number.

National Electric Light Association and Association of Edison Illuminating Cos.: L. L. Elden, Edison Electric Illuminating Co., 39 Boylston St., Boston, Mass.; J. A. Johnson, Niagara Falls Power Co., Niagara Falls, N. Y.; L. G. Smith, Consolidated Gas, Electric Light & Power Co., Baltimore, Md.; R. H. Tapscott, New York Edison Co., Irving Place and 15th St., New York; H. R. Woodrow, Brooklyn Edison Co., Pearl and Willoughby Sts., Brooklyn, N. Y.

Underwriters' Laboratories: J. M. Salling, Underwriters' Laboratories, New York.

United States Bureau of Standards: A. S. McAllister, United States Bureau of Standards, Washington, D. C.

United States Navy Department: Head of Specification Section, Design Division, Bureau of Engineering. Member: C. S. Gillette; alternate, V. V. Woodward, Navy Yard, New York.

United States War Department: Col. C. A. Seoane, Signal Corps, 39 Whitehall St., New York.

D. C. Rotating Machines, Generators and Motors

The American Institute of Electrical Engineers has been appointed sponsor by the American Engineering Standards Committee for recommendation relating

to a national standard on direct current, rotating machines, generators, and motors. W. I. Slichter, Columbia University, New York, has been appointed chairman of the reviewing committee which is composed of the following members:

American Electric Railway Association: H. A. Kidder, Interborough Rapid Transit Co., 600 W. 59th St., New York.

American Institute of Consulting Engineers: P. M. Lincoln, Cornell University, Ithaca, N. Y.; N. J. Neall, 12 Pearl Street, Boston, Mass.; George Gibbs, Pennsylvania Station, New York.

American Institute of Electrical Engineers: J. L. Burnham, General Electric Co., Schenectady, N. Y.; David Hall, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.; J. M. Hipple, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.; E. B. Paxton, General Electric Co., Schenectady, N. Y.; W. I. Slichter, Columbia University, N. Y.

American Marine Standards Committee: R. A. Beekman, General Electric Co., Schenectady, N. Y.

American Mining Congress: Carl Lee, Peabody Coal Co., Chicago, Ill.

American Railway Engineering Association: E. B. Katte, New York Central R. R. Co., 466 Lexington Ave., N. Y.

American Society of Mechanical Engineers: Everette K. Morgan, Ingersoll Milling Machine Co., Rockford, Ill.

Association of Iron & Steel Electrical Engineers: One representative to be appointed.

Bell Telephone Laboratories: A. E. Petrie, Bell Telephone Laboratories, 463 West St., N. Y.

Electric Power Club: Representatives to be appointed, approximately five in number.

National Electric Light Association and Association of Edison Illuminating Cos.: L. L. Elden, Edison Electric Illuminating Co., 39 Boylston St., Boston, Mass.; J. A. Johnson, Niagara Falls Power Co., Niagara Falls, N. Y.; L. G. Smith, Consolidated Gas, Electric Light & Power Co., Baltimore, Md.; R. H. Tapscott, New York Edison Co., Irving Place and 15th St., New York; H. R. Woodrow, Brooklyn Edison Co., Pearl and Willoughby Sts., Brooklyn, N. Y.

Underwriters' Laboratories: J. M. Salling, Underwriters' Laboratories, New York.

United States Bureau of Standards: A. S. McAllister, United States Bureau of Standards, Washington, D. C.

United States Navy Department: Head of Specification Section, Design Division, Bureau of Engineering. Member: C. S. Gillette; alternate, V. V. Woodward, Navy Yard, New York.

United States War Department: Col. C. A. Seoane, Signal Corps, 39 Whitehall St., New York.

Progress Made in Underground Communication

Studies recently completed by engineers of the Bureau of Mines attached to the bureau's experiment station at Pittsburgh, Pa., have demonstrated that voice signals can be transmitted in and out of a mine through more than 400 feet of underlying strata by the use of dry cells as a source of electrical energy and modified telephone parts as receiving and sending apparatus. The feasibility of conducting a conversation through considerable depths of earth strata has been proven. Further experimentation is needed to determine the best methods of applying these principles to practical mine conditions and for the improvement of the apparatus for practical use in mine rescue and recovery work. The development of practical means of communication between miners entombed following mine fires and explosions and rescue parties on the surface would naturally be of the greatest aid in the conduct of mine rescue operations.

Ventilation of Metal Mines

It is recognized that in many places the metal-mine worker has a serious menace in harmful dust and poor ventilation, and that such conditions react unfavorably on the health, comfort and efficiency of the miner. In order to obtain data on working conditions and remedies, the Bureau of Mines has for some years been studying conditions in the metal mines throughout the country.

A study of temperatures, humidities, air movement and quality of air has been conducted by Bureau of Mines engineers in eight of the larger metal mines of Nevada. As a result, detailed information on ventilation conditions was obtained and recommendations prepared that should result in the betterment of underground conditions. Similar studies are being conducted in metal mines of the Lake Superior district.

Deep mines often encounter hot, humid, working conditions in the lower levels, due to the natural heat of the strata. The possibilities of local cooling of the air in such working places are being studied in copper mines at Butte, Mont. Work is in progress to determine the difficulties in application of experimental data to ventilation control. While natural draft is a very important factor in ventilation of deep mines, little is known of its action except in theory. Tests are being conducted on a mine with natural draft without a fan, and with the fan in operation. This latter work is a continuation of the study of resistances of metal-mine airways, soon to be published as Bulletin 261 of the Bureau of Mines.

THE NATION'S VIEWPOINT

A Digest Of The Expressed Opinions Of Leaders In American Affairs

CONGRESSMAN JOHN Q. TILSON, majority leader of the House in a recent address on the tariff, said:

"If the protective tariff were removed, leaving the American market open to all the world on equal terms, there would soon be a change in the methods of foreign manufacturers that would make 'Americans dizzy.'

"Do away with our system of protection, and soon Europe will equal us in machinery and equipment, learn how to use them effectively, pay less than half our wage scale to their workers, and somebody in this country would be hurt seriously.

"I wish that the tariff question might be regarded as settled so far as the political side of it is concerned, but it can not be so long as one of the two major parties keeps this issue up its sleeve, ready to bring it forth when the occasion may seem auspicious.

"The wages of our workers are higher than in any other country. Other things being equal it is quite evident that the foreign producer would soon completely take our domestic market and drive our producers from the field if permitted to enter the market without a charge of some kind to offset this advantage."

In a recent editorial in *Railroad Timely Topics*, the lack of appreciation by the masses of the magnitude of government and their duty to government, is expressed as follows:

"Government is the most important big business in the world. It is a \$10,000,000,000 business in the United States. It is a sad thing that it is our most neglected business.

"Most people accept government as they do the rain and snow, without realizing that it is something entirely within their control. Few people ever think of the possibility of its destruction.

"The average man or woman does not realize that the per capita cost of running our government is about \$90, and that this means that the average family contributes each year more than \$499 in taxes. The Government

has found that the per capita cost of government in our largest cities was \$118, while the per capita food cost was only about \$95.

"If \$8 were actually taken from the family pay-envelope every Saturday night for taxation purposes, then the average citizen would awake to the fact that he is a taxpayer, and realize that most taxes finally become consumption taxes, and that the consumer is the great taxpayer.

"Federal taxes were reduced about \$125,000,000 in 1924. But on the other hand, state taxes were increased \$119,000,000 and local taxes were \$147,000,000. The \$10,000,000,000 cost of national, state and local governments last year was more than the total value of all the chief farm crops of the nation by \$500,000,000.

"The function of government is to provide a safe place in which the people may carry on their struggle to improve their condition. We have departed far from this. The departure is so great that we might say of our present system of government the very same thing that our forefathers said in '76 of the king of England: 'He has created a multitude of new offices and sends hither swarms of officers to harass our people and eat out their substance.'"

That the present activity in bituminous coal is deceiving no one, unless it be the president of the United Mine Workers, is the opinion of the *Wall Street Journal*, which editorially says:

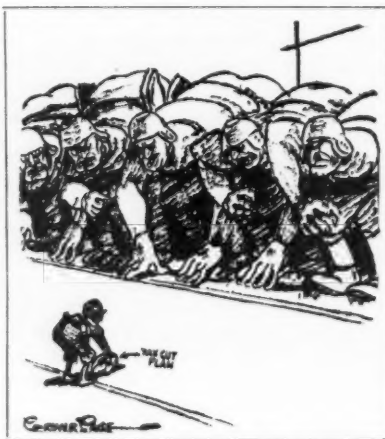
"For the purposes of a public statement, at least, President Lewis of the United Mine Workers sees what the press dispatches credit him with calling 'a distinct victory' in the return of certain West Virginia and Pennsylvania bituminous operators to the Jacksonville wage scale. Mr. Lewis declares such action on the part of the operators within recent weeks 'proves



© The Chicago Tribune
The Democratic Leaders Can't Work Any Popular Indignation Against Tax Reduction

our contention that there was no good reason in the first place for any reduction.'

"It is hard to believe that any man of ordinary intelligence can sincerely draw that inference. The head of the miners' union should know better than most men how many operators in the unionized central competitive district were virtually out of business for the better part of two years after the conclusion of the Jacksonville agreement in 1924. If he has not observed it himself, stockholders of the Chesapeake & Ohio and Norfolk & Western railroads, the leading carriers of non-union coal, can tell him something interesting about the tremendous increase in earnings of those roads the past two years.



Louisville Courier Journal
The Coming "Legislative Executive" Game

"At the end of October the average price of all grades of bituminous coal at the Pittsburgh district mines was at its highest since April, 1923. Mine run coal was selling at \$3 to \$3.50 a ton, compared with \$1.40 to \$1.75 as late as the end of August. During October 3,047,000 tons of coal were dumped at the Hampton Roads coal docks, most of it for export or bunkering, a new high record for the port. So exigent has been the foreign demand that recently it was stated that more than 100 vessels were racing to Baltimore to load coal for Europe. Philadelphia, never a coal export point under ordinary conditions, shipped nearly half a million tons abroad during October and some export cargoes

tion is already being written in their rapid drift back to the pits without the consent of their leaders."

While the whole trade union movement in Great Britain may not fairly be judged in the light of the deplorable coal strike, there is very good reason why the strike should be taken as an incident to give relevancy to a new direction to indus-



© Kansas City Star
"The Bigger, the Better!"

have even gone out through New York and New Orleans.

"It is no use to say that because exports take a seemingly minor part of a monthly production of 50,000,000 tons, the British mine strike is a negligible factor in the present coal situation here. The export and bunkering demand attributable to the British tie-up is enough in itself to have made a deep impression upon it; coming as it did when stocks on hand were subnormal, when industrial consumption had been large and increasing for months, with winter at hand and the Jacksonville agreement itself due to expire next April. The world situation made it not only possible but profitable for operators to bid for man-power.

"All of this Mr. Lewis chooses to interpret as a victory for the tactics which have cost union miners uncounted millions of dollars in lost wages. How much they can recoup themselves while the coal boom lasts depends upon how much punishment the unemployed British miners can stand. But the answer to that ques-



© N. Y. Tribune
That Little Bird Again

trial legislation, alike in the interests of the workers and in the interests of the country as a whole, says an editorial in the *Montreal Gazette*. Continuing they say:

"A convention of the Conservative Party, in session at Scarborough, has in this relation adopted resolutions, the most important of which advocate such changes in the trade union laws as would make illegal any strike in the future without a previous secret ballot of the members of the union affected. The secret vote would free the men from all fear of intimidation, and the result, therefore, would be a true expression of the opinion of those directly concerned. The opposition of certain labor leaders to such a proposal will, of course, be loud and long, and difficulties in the way of its adoption may be found more serious than any which can be advanced to a restriction of picketing on the lines proposed in the Scarborough resolutions. There ought to be no hesitation to consent to legislation which would increase the security of the individual worker against victimization and intimidation, or to making mass picketing and the picketing of a man's private residence illegal. If the secret ballot could be accepted, the whole question of picketing would inevitably become less accentuated and not so



The Chicago Tribune
Who Said Cal Was Losing Out?

recurring, because there would be fewer strikes.

"The trade union situation in England today is remarkable. The decade 1910-20 was very productive of labor legislation, partly the outcome of years of agitation and the growing political power of labor and the spacious years following the war saw further development of trade unions into political machines. This growth brought about more industrial intimidation and led to spasmodic political intimidation intended to hold-up the country and dictate to the Government. The latest example of this was the general strike this year. With it all there has been a marked expansion of trade unionism officialdom and larger expenditures on staffs, which have involved a swollen government official army in the Ministry of Labor and elsewhere to correspond. This means that workmen are more heavily taxed by their unions (and in this respect there is at present a great outcry for the separation of union benefit funds from strike and political funds), employers are taxed by their organizations, everybody is taxed by the state, and many of the proceeds are obviously wasted in open or latent industrial warfare. It is against a situation that has resulted from this system that there are growing signs of revolt, and the protest that has taken the shape of the Scarborough resolutions does not exaggerate very much the opinion of a very much larger public. If the Government does not proceed to measures as extreme as members of the conservative conference urge, it is, at all events, clear that Mr. Baldwin will very soon have to attempt some departure that will effect a needed change in the laws that govern trade unions."

While agreeing with the *New York Times*' estimate of the present satisfaction of the wage-earner, WILLIAM B. WILSON, former Secretary of Labor, as quoted in the *Wallace Press-Times*, is of the opinion that the worker himself is more responsible for this situation than its management:

"The Department of Labor has figured out that while a Chinese coolie



Great Year for Game

makes only 50 cents a day and a British workman only about \$2 a day, the organized workman in the United States receives an average wage of \$8.50 a day.

"An interviewer for the *New York World* asked former Secretary of Labor William B. Wilson his opinion as to why this is so. His reply was prompt.

"In the first place, the American workman produces more than any other laborer in any other country in the world. In the second place, he is aided by up-to-date and efficient machines. And finally, the general policy which has been worked out by the American laborer is wise."

"That policy recognizes the mutual interest of employer and workman and seeks to decide the fair division of their joint production by as equitable an arrangement as circumstances permit.

"Mr. Wilson admits that not all employers and all laborers go about this problem in this sensible and mutually beneficial way. He believes, however, that the tendency is in the direction of recognition of mutual responsibility and mutual benefit.

"Mr. Wilson's is a voice of intelligence and authority. What he says in this regard should be of interest and value to American workers and employers."

John E. Edgerton, President of The National Manufacturers' Association, in

his address to their annual convention, points out some pertinent truths in regard to the attitude of employers toward their employees. After reviewing the splendid results that have been achieved through associations, Mr. Edgerton says:

"At no point in the history of associations have I been able to find that a national association of employers was ever formed to oppress or harass labor. Undeniably, however, since there was more than one employer, there have always been some individuals, and later incorporated groups of employers, who have been selfish and unfair in their



Careful Papa

dealings with and attitudes toward their employees. But they have never been a dominant majority in America and have been constantly diminishing in both their relative number and influence as the processes of education and moral reform have made clearer the requirements of justice and of sound economic practice.

"Great national associations have, first of all, an obligation to the public; and so long as they keep that consideration uppermost and perform consistently with it, they will live. No organization has a right to exist that places the interest of its constituency above that of the public, and it should and will ultimately die. There will perhaps continue to be either imaginary or real occasions for the belligerency of offended principles, and I would never discourage lawful resistance to any force of unrighteousness. On the contrary, I believe that no price is too great to pay or sacrifice too large to make in defense of a principle of established right and justice. But too often men mistake opinions for principles, and as a rule those who are quickest to resent insults to their pride of opinion are the first to make a cowardly surrender to the expedienries of an unjust force.

"In this connection, though I admit

it to be slightly alien to my subject, I can't resist saying that there are two types of employer which have always threatened the stability of industry. One is the so-called Bourbon type, of which now there are very few. Your familiarity with the descriptive term makes unnecessary an analysis of the characteristics of this division. Perhaps, the modern slang expression 'hard-boiled' is the best synonym with which to complete a deficient understanding of this sort of employer. The other type is directly opposite to his make-up. He may be called 'soft-boiled' or 'poached,' and he runs all over the plate at the slightest pinprick. He is very sure that practically all other employers are hard-hearted, cruel, and unjust, and that his way is the only model worthy of copy. He will not associate at all or but very little with other employers formally because he is so much more human,



Wallace Press-Times

A Shot in the Arm

broad and wise, and because nobody has an experience that will be helpful to him. He has acquired great wealth either by the accident of inheritance or by force of some other fortuitous circumstance and is trying to curry favor with the public, or somebody has made a Christian of him with a club. The first of these types is controlled primarily by his liver, and the other by his heart; while the head in both cases has played a losing part. But both types, being now very small in number, may be left out of consideration except as the extremes of industrial society which constitute its guide-posts. The thought is suggested by these observations, however, that an employer's obligations to his fellow-employers are just as morally inescapable as those to his employees, his community, and the public. When he feels too big, too proud, too self-centered, or too timid to associate constructively with other employers, he is a liability to industry and all its parts.

"In descending to the consideration of the individual employer for a moment, I have felt justified by a consideration of the fact that as individuals are so will be their organizations. And this is distinctly a day of organization. The individual has ceased to play the part that he once did in meeting the multiplying problems of our complex society."

That the whole of business success, particularly that of the mining industry, is based upon public confidence in the men at the head of our great industries, is the opinion of Litson Balliet, in the *Tonopah Bonanza*:

"All business is a confidence game. You don't deposit money with a banker unless you have confidence in him. You don't send for a doctor in whom you have no confidence. You don't do business with a tailor unless you have confidence that he can make you a proper fitting suit of clothes. You don't employ a lawyer unless you have confidence in his ability. You don't trade with a merchant unless you have confidence that he will not swindle you. You don't even read the newspaper unless you have confidence in its news. You don't invest in any business unless you have confidence in the men behind it. Mining is no different from any other business. It is just as strong, just as safe, just as reliable, just as honorable, as the

more profitable than any other business in the known world. It has the automobile, railroad, banking and moving picture business backed off the board for profits and for that reason there are many ambitious attempts by incompetent and illy advised promoters 'to get up a mining company.'

"Imitation is the sincerest form of flattery. If the mining business were not profitable there would be no imitators. Nobody imitates a counterfeit nickel, or anything else that is worthless. By comparison just stop to think of the numerous ambitious attempts that have been made to 'get up a moving picture company,' or a new rubber tire company, or to start a new automobile factory, and, more recently, the number of radio corporations that have been foisted on the public. Ninety-nine out of 100 have been failures. Why have there been so many attempts to rush into the business? Because these companies that have been competently managed and financed in the moving picture, automobile, rubber and radio businesses have become enormously profitable, while the ambitious imitators failed.

"If Henry Ford, J. Pierpont Morgan, John D. Rockefeller, John Hays Hammond and Andrew Mellon were to organize a mining company, an automobile company, a rubber company, or a steel company, thousands of people would rush to buy stock in the company backed by such men. The investors would not stop to ask, 'Where is the property?' 'What is the title?' 'How much does the ore assay?' 'How far is it from market?' or any of the other usual questions asked by invest-

ors. It would be assumed that these men would not go into any industry without being sure that the titles were perfect and that all other details had been carefully figured out. In other words, the public has confidence in the men and would feel confident that unless the project had merit these men would not lend their names to it.

"But, even so, if these men were to issue a prospectus concerning the business and the company in order to sell stock, few people would even take the time to read the prospectus. The names of the men would be enough. Those who did read the prospectus through would still have confidence that the men had made no misrepresentations. But let us take the same prospectus on the same proposition without changing a syllable except to remove the names of the five prominent gentlemen, and insert in their places the names of obscure and unknown butchers, grocers, bakers, waiters, bankers, lawyers and doctors from small towns and mining camps, we would then find but little interest in the prospectus. Obviously, it is the confidence one has in the men behind the business that makes it a success.

BUREAU OF MINES ACTIVITIES

(Continued from page 892)

The Bureau is endeavoring to develop mill-ball material that may greatly minimize these losses. Improved metallurgical practices designed to utilize enormous deposits of low-grade lead, zinc and copper ores are being developed at the Bureau's different experiment stations located in the mining districts of the West. The application of oxygen or oxygenated air to metallurgical fields and problems is being studied. Development of such processes, depending on methods for the cheap production of oxygen, would effect considerable savings in many metallurgical processes.

At its New Brunswick, N. J., experiment station, the Bureau is studying methods for the utilization of small limestone fragments now wasted at lime plants. In view of the wide use of mica in radio and electrical equipment, better methods for the mining and preparation of this material are being investigated.

With the transfer of the Bureau to the Department of Commerce, an Economics Branch was established for the study of economic problems in the mineral industries. This new branch is giving attention to the uses of coal, coal reserves, prices, distribution, consumption, stocks and marketing. A statistical analysis of strikes and lock-outs in the coal-mining industry during the past 75 years has been made.



© Seattle Post-Intelligencer
The Rainmaker Makes Good

men behind it, and no stronger. And so is every other business.

"Unfortunately mining is looked upon by those who are unfamiliar with the business as 'fortune hunting' instead of a very practical business. It is profitable. When rightly managed and competently financed it is



Pittsburgh Gazette Times
If Drops of Water Will Wear Away a Stone—

MECHANICAL LOADING

(Continued from page 885)

permit the successful application of mechanical loading or that all situations where mechanical loading can be applied, will be as successful as the case mentioned, but the point I wish to emphasize is that before concluding that one's particular condition precludes the use of mechanical loaders one should carefully study the economic progress made in the past two years. In that time we have learned many "bugbears" have no foundation; that they can be avoided or overcome and we also have learned many points to be carefully considered in any efficient loading plan.

At the present time, with the prices for coal unusually low and competition in preparation acute, some large operations working on old methods, have not returned a profit over considerable periods. The operators of today must be willing to put the enthusiasm into their staffs and personnel and by the exercise of proper judgment and persistent effort not merely install loading equipment but work out a well coordinated plan that will yield from the wide work from 20 to 40 tons of coal per man, employed in the area served by the loaders. I think the time will come when installations doing much less than this will require explaining, although, of course, there will always be exceptionally difficult situations.

Considering the general mining systems that have been tried to concentrate and obtain larger tonnages per unit area in the thinner seams, a review of the situation shows that long-wall advancing with handling of rock or timber cribs, or break rows of timbers are too costly in the majority of cases to successfully compete with other mining methods. They require too much hand labor and too much material. While these systems are largely used in Europe, they succeed on low priced labor and high priced market for coal.

In America the mechanization of entry driving which has cheapened its costs and increased rate of progress has made commercially possible retreating systems similar to the old English bord and pillar methods, or well known pillar drawing methods where with the assistance of mechanical loaders, much less labor and timber are used and it is believed that these systems will come into increased use in connection with mechanical loading in thin veins.

The two loaders which have been described as especially adapted for entry driving, depend for their rapid advancement upon shooting the coal several times a shift. As the law permits shooting coal but once a day in some states, these devices there could only advance the entries about 7 feet per shift.

There is one factor that must be care-

fully studied—those loaders which require the least room and are the most compact have the smallest capacity and the ingenuity of the operating engineers is being tested to find under certain difficult conditions a system which can be adopted under the conditions which will give proper and safe working clearances for the loading devices that have the higher capacity. It is often very easy to adopt a system where the timbering must be close but the tonnage results obtained will be disappointing.

Some of the larger loader or shovel manufacturers maintain a staff of engineers who have made a study of loading and their men by visiting practically all of the loader installations are in a position to bring to the operator valuable suggestions and in case they install the equipment, they can bring cooperation and service that will be of the greatest value in carrying on his work.

In this brief review, I have touched in a general way on some of the essential factors that have to be considered in the adoption of mechanical loading and have attempted to emphasize the necessity of planning an installation so as to obtain either from thick coal or thin, an output per man per day, that will compete successfully in cost with any other operation and which will improve the percentage of lump, the cleaning of the coal and the firmness of the lump, over and above that which is obtained by the old hand methods, always recognizing that some conditions will prevent such results.

MINING AT CHUQUICAMATA

(Continued from page 878)

shovels. Hoist motors are rated at 250 H.P. and swing and thrust at 75 H.P.

All Marion shovels, together with the Bucyrus 120-B shovel are actuated by direct current Ward-Leonard control and have the same type motors and generators. The latter consists of a 5-unit set driven by a 5,000-v. 225-H.P. A.C. synchronous motor. The generator set has three variable voltage direct current generators which, when operating under full load, are rated at 250-volt. The hoist generator is 125-K.W., the swing 35-K.W., and the thrust 30-K.W. Also included in the set is a constant voltage direct current exciter. The direct-current motors are of the heavy mill type, with cast steel frames, operating at 230-volts, the hoist motor being rated at 175 H.P., swing 43 H.P., and thrust 40 H.P. All direct current machines are equipped with General Electric Ward-Leonard generator field controls, which allows varying the motor's speed and torque by changing the field strength of each respective generator.

The Bucyrus 320-B shovel is operated by direct current in the same manner as the other direct current shovels. The

generator set is driven by a 5,000-volt, 435-H.P. synchronous motor, the hoist generator being rated at 250-K.W. with 600-volts, while the swing and thrust motors are rated at 75-K.W. with 250-volts and 50-K.W. with 250-volts, respectively. There are two 175-H.P., 230-volt hoist motors connected in series together with a 105-H.P., 230-volt swing motor and a 85-H.P., 230-volt thrust motor.

The growth of the mine is well shown in Table 5, which shows the tonnages of ore and waste hauled since the beginning of operations. The organization of forces is shown in the chart Figure 17. While the greater part of the labor is the native Chilean, the supervision is by "Foreigners" the number employed being as follows:

Mining, including shovels, tracks and dumps.	19
Drills	4
Machine Shop	12
Electric Shop	10
Transportation	5
Accounting and Time Keeping	1
Superintendence, Engineering & Statistics	14
Warehouse	3
Primary Blasting	5
Underground Development	1
Secondary Blasting	3
Sampling and Assaying	1
Prospecting	1
Total	79

An idea of the number of shifts necessary to carry on mining operations can be had from Table 6, giving the number of man-shifts for the first four months of 1926. The efficiency of the organization as a whole, and of the different parts, for the same four months is high, as shown by the following production in tons per man-shift, being the total tonnage, including ore and stripping:

Drilling and Blasting	86.7
Shovel Operation	138.8
Transportation	128.9
Machine Shop	113.7
Electric Shop	274.2
Engineering and Statistics	525.3
Track Maintenance	184.1
Miscellaneous	91.4

Total men at Mine..... 17.5
Data taken over period of January to April, 1926, inclusive.

The improvement in costs and increase in efficiency are due both to better physical conditions of the ore body worked and the development of a good working organization, backed by improved equipment. Another feature that has added greatly to results is the institution of a system of bonuses to all labor.

This organization has been developed and improved through an attitude of justice and fairness on the part of the management. All departments have some form of labor bonus which at the present time proves to be the best inducement to produce. It has been the problem, and still is, to educate the Chilean to a better scope of living, and by so doing bring him to see and accept more responsibility. The success in teaching the Chilean laborers has the greatest effect of all in bettering efficiency.

BUREAU'S FILMS TELL STORY OF MINING

The largest collection of educational motion picture films depicting the mining, treatment, distribution and utilization of the numerous essential minerals ever compiled is in the possession of the Bureau of Mines. At present the Bureau's motion picture library comprises more than 50 subjects visualizing the operations of the mineral and allied industries of the nation.

The more than 2,000,000 feet of motion picture film now possessed by the Bureau represent an expenditure of almost \$1,000,000. The entire expense of making the films has been borne by private industrial enterprises who have cooperated with the Bureau of Mines in this work.

A number of highly interesting films depicting the production, refining and distribution of petroleum have been made by the Bureau. "The World Struggle for Oil," a 7-reel feature, visualizes the story of petroleum in all parts of the globe, from the earliest use of the material, as pitch, smeared on Noah's Ark. "The Story of Petroleum," in four reels, begins with the location of a new well by the geologist, and carries the story to the distribution of gasoline by service stations. "Mexico and Its Oil," "The Story of a Mexican Oil Gusher," and "Through Oil Lands of Europe and Africa," are other films depicting graphically the story of the development, by American capital and enterprise, of the oil fields of foreign lands.

The Bureau of Mines is undertaking an intensive campaign for the promotion of safety in the oil industry of the nation, and two films, "When Wages Stop, or Safety First in the Petroleum Industry," and "Live and Let Live," show the safe and unsafe ways of producing oil. "The Story of a Rotary-Drilled Oil Well" was made in the Goose Creek oil field in Texas. "The Story of Natural Gas," in four reels, made in cooperation with the Natural Gas Association of America, begins with the location of a new gas well by the surveyors, and proceeds to the distribution of this fuel to the cities.

"The Story of Coal," made in cooperation with the National Coal Operators' Association, has proved to be one of the most popular films in the Bureau's library. "When a Man's a Miner," a graphic coal-mine safety film, was donated to the Bureau by Capt. Stuyvesant Peabody, in memory of his father, the late Francis S. Peabody, prominent coal operator and former Assistant Director of the Bureau. "The Story of a Rock-Dusted Coal Mine," produced in one of the world's best equipped coal mines, shows vividly how the rock-dusting of bituminous coal mines will prevent disastrous explosions. "Twelve Points of Safety" and "First-Aid, or the Care of

An Injured Miner by a Miner," are short safety films intended to instruct miners in safety.

"The Story of Sulphur" shows the ingenious processes by which sulphur is brought from the deposits lying 1,000 feet below the earth's surface. "The Story of Asbestos," "The Story of Abrasives," and "The Story of Portland Cement" depict the processes employed in the mining and preparation of these essential materials. Various phases of the technology of iron and steel are portrayed in "The Story of Ingot Iron," "The Story of Steel," "The Story of Alloy Steel," and "The Story of the Heat Treatment of Steel."

The production of motion-picture films is conducted under the supervision of M. Leopold, safety engineer, and the distribution is centered at the United States Bureau of Mines' Experiment Station, Pittsburgh, Pa., under the direction of R. A. Wood. In addition to the distribution carried on from Pittsburgh, 16 sub-distributing centers have been selected with regard to accessibility. The final censoring of a film is done by a board of review selected from the technical staff of the Bureau of Mines. The films are loaned free of charge to all desiring to use them, with the understanding that they will receive the best possible care, and that all damages and loss other than nominal wear and tear will be replaced by the borrower. A revised list of the Bureau's motion pictures has just been issued, and a copy of the list may be obtained by addressing the Bureau of Mines, Department of Commerce, Washington, D. C.

BITUMINOUS CONFERENCE

(Continued from page 893)

manufacture and burning of smokeless fuel. O. P. Hood, of the Bureau of Mines, said that the highest volatile coal can be burned without smoke if conditions are adjusted to the qualities of the fuel, furnace design, adaptation to service, and care in operation.

Robert M. Crawford, chemical engineer of Pittsburgh, stated that the coal tar situation in this country is not economically sound as there are more tar acids destroyed in the combustion of coal tar than is needed to supply the demand for these products in the refined state. He stated that the increase in the use of coal tar for steel plant industrial fuel prevents the tar distillation industry from supplying other needs of the country. He stated that steel plant fuel tars, can be stripped of the phenol and cresols to supply domestic needs without depressing the fuel value of the tar. John M. Weiss, chemical engineer of New York, defended the apparent waste through the failure to distill tar in the steel industry, saying that tar fuel is available in steel plants and is

not subject to transportation and other difficulties. It is low in sulphur and produces a flame especially suited to the open hearth furnace. At the price at which the tar could be sold to distillers there is little or no financial advantage above the fuel value. He said some steel mills had been considering the question of the partial distillation or topping of the tar, separating light oils, phenol and cresols, and using the remainder for fuel, one mill having installed a plant to distill its tar. Prof. Frans Fischer, director of the Institute of Coal Research of Germany, spoke of the possibility and methods of producing petroleum-like products from the bitumen of coal, peat and oil shale by decomposing these materials.

Gustav Egloff, of the Universal Oil Products Co., of Chicago, said that the bituminous deposits of the country could supply the world with motor fuel for the next 800 years.

W. A. Darrah, of the Continental Industrial Engineers of Chicago, predicted that the next few years would see a greater activity along the line of low temperature distillation of coal with a view of assisting in the transformation of the coal industry into a stabilized profitable business for the owners and workers.

C. V. McIntire, of the Consolidated Coal Products Co. of New York, said an artificial anthracite of good quality sold at a lower price than anthracite now used, would solve the smoke problem. His company has developed a process of heat and pressure similar to that which nature transforms bituminous into anthracite. The artificial anthracite is produced in briquette form and has all the essentials of the present anthracite, except slate and other dirt.

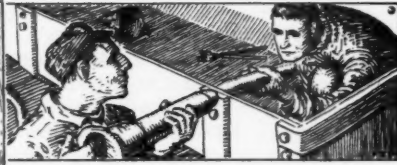
It was stated by H. A. Brassert, consulting engineer of Chicago, that fuel savings are possible at most iron and steel plants, through the more efficient and complete use of surplus gases and waste heat. He stated that improvements in the use of surplus gases and waste heat in the industry would eliminate the smoke and dust nuisance.

Possibilities of power development at Muscle Shoals in the manufacture of nitrates were discounted by Charles J. Brand of the National Fertilizer Association. He said the development of the synthetic ammonia process has scrapped the belief that cheap hydroelectric power is indispensable in the production of air from nitrogen. He said that surplus power from Muscle Shoals should be sold to any industry requiring it.

The conference was marked by trips of inspections to the various mines and steel plants in the Pittsburgh district. It was so successful that plans are under way to arrange for similar conferences at stated periods in the future.



WITH THE MANUFACTURERS



Link-Belt Announce New Ball Bearing Vibrating Screen

Marked by simplicity of construction, and requiring, it is asserted, a minimum upkeep expense, and possessing adaptability to almost any fine screening condition, a new Ball Bearing Vibrating Screen has just been announced by Link-Belt Company, of Philadelphia, Chicago and Indianapolis.

This screen is a mechanically operated device, reduced to the simplest possible mechanism, viz, one moving part which rotates in large, oversize ball bearings.

The vibrator has no cams, springs, striking blocks or levers to adjust or renew. It simply consists of a shaft, driven at suitable speed from any common source of power. This shaft, thrown out of balance by adjustable counterweights, imparts vibrations to the screen box on which it is mounted, and these in turn are transmitted to the screen cloth secured, under tension, in the box.

There are five standard sizes, viz, 2' x 5', 3' x 5', 4' x 5', 3' x 8', and 4' x 8', and each can be furnished with either one or two screening surfaces, giving a wide application for materials of varying size and capacities.

Screen Cloth.—The screen cloth is placed upon the deck with its two longitudinal edges bent up.

Binders are provided on the fine mesh cloths for protection against tearing. Two flanged clamp plates engage these binders, or the bent edges of the cloth, and by tightening the wing nuts on each side the cloth can be quickly stretched to the desired tension.

These side clamp plates serve the four-fold purpose of stretching the screen cloth, clamping the cloth to its deck, eliminating wear of screen box side frames, and preventing leakage along side edges. A longitudinal vibrator strip assists the screening action by imparting raps to the cloth—minimizing wear and binding.

Binders are quickly detachable and can be reused; and screen cloths, which are of standard width, can be obtained in rolls from the cloth manufacturers.

Feed Hopper.—A feed hopper attached to the receiving end of screen box vibrates with it, controls the feed, and uniformly spreads the material over the screening surface.

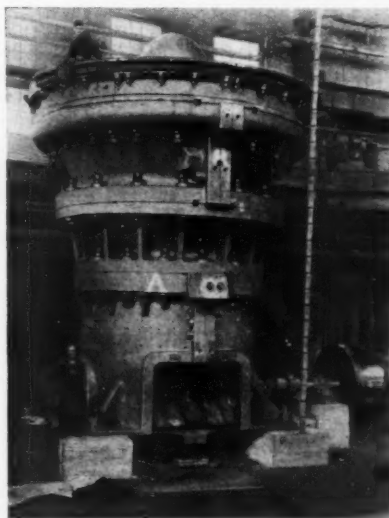
Automatic Regulating Gate.—For screening materials containing small par-

ticles, such as brick clay, etc., the vibrating feed hopper is fitted with a counterweighted swinging feed gate.

This combination makes it easy to receive a non-uniform feed, and spreads the material over the width of screen cloth at just the right speed—moreover adding about 2 feet to the effective length of the screen, and obviating the use of mechanical distributors.

World's Record Crushers

The two largest ore crushers ever built are now being shipped from the West Allis Works of the Allis-Chalmers Mfg. Co., Milwaukee, establishing an-



other world's record for the lines of heavy machinery built by this company.

These crushers, weighing 1,000,000 pounds each, were designed and built for the Chile Exploration Co., a subsidiary of the Anaconda Copper Mining Co. for installation at Chuquicamata in the Andes Mountains near Antafogasta, Chile.

On account of the hardness of the copper ore which they must handle, the crushers are of an especially heavy design, built almost entirely of steel, the castings and forgings being among the largest ever made in this country.

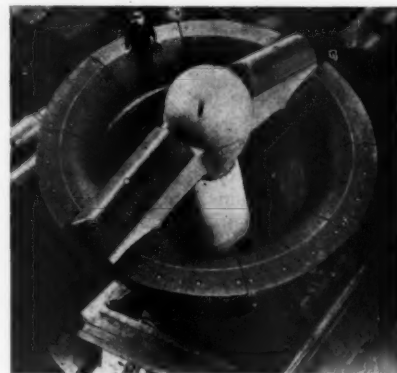
Two hopper openings each 5 feet across, permit a carload of ore weighing 70 tons to be dumped into the crusher at one time. Some pieces of the ore will weigh as much as seven tons. This will be reduced to a 12-inch product; each

crusher handling from 2,000 to 2,500 tons of ore per hour.

The problem of shipping the extremely heavy parts of these machines has been further complicated by the fact that they must be built in sections to facilitate handling in transit and final transportation in the mountains. The largest pieces weigh 60 tons each.

Shipment will be made by rail to New York, 25 freight cars being required to handle the two crushers and spare parts. At New York shipment will be loaded on the Chile Exploration Co.'s steamer Chilcop, which is especially equipped with heavy derricks for handling this machinery. Proceeding by way of the Panama Canal, the shipment will follow the west coast of South America to Mejillones, a port near Antafogasta, where owing to the lack of harbor on the Chilean coast, the machinery must be transferred to lighters, towed in to shore, pulled on the beach and transferred to cars on a 30-inch narrow gauge railroad. Over this narrow-gauge mountain railroad the shipment will be carried to the mine at an altitude of 9,500 feet, or more than one and three-fourths miles above sea level. The narrow gauge railroad, steep grades and sharp curves, together with the heavy pieces to be transported, have necessitated the building of special cars to handle these machines.

In design of these huge machines which are of the Allis-Chalmers Superior McCully Gyratory type, the engineers were not only confronted with the problem of designing the largest ma-



chines of this type ever built, for the most severe service, but had to take account also the question of shipping them over 5,000 miles under the most unusual conditions.

New G. E. Time-Delay Attachment For Hand Starting Compensators

A new time-delay attachment, announced by the General Electric Co., is designed for use with hand-starting compensators to provide undervoltage protection during brief disturbances in industrial power circuits. Many establishments, utilizing a large number of motors, run separate circuits to energize the undervoltage coils of the starter, this circuit being furnished by a motor generator running on its own momentum for some time after the failure of power. The new attachment was developed to meet the demand for a time-delay undervoltage release, resulting from the larger number of potential dips caused by the increased use of such power systems, and the wider use of undervoltage protection on motor starters.

The attachment bears the designation CR-2820-1062. It can readily be mounted on a hand-starting compensator in the same supporting holes as used for the standard undervoltage release.

Time delay is accomplished by a falling solenoid plunger, whose downward movement is retarded by a flywheel. A rack, which turns the flywheel by means of a pinion on its shaft, is fastened to the solenoid plunger. On the downward movement of the plunger, the flywheel is caused to revolve, but the parts are so designed that the upward movement of the plunger disengages the teeth of the rack from the pinion, permitting an instantaneous movement. The time delay is about 1½ seconds, and if power returns in less than that time the starting compensator is not tripped.

New Air Filter

The American Blower Company, of Detroit, Mich., manufacturers of air-handling equipment since 1881, announce a new air filter which, they state, is revolutionary in design and eliminates the many difficulties heretofore found in air filters.

According to their statement "by means of this new filter, which is of dry plate design with hair-like tentacles for the arresting and retention of dust and dirt, dust-laden air is divided into a series of small jets which strike the flat filament coated surface of the plates, dust and soot are projected against the filament, seized and retained. The air, changing its direction and rebounding from this surface flows through to the next plate and is carried through ten successive dust removal operations of this type. As dust builds up on these flat surfaces, each preceding layer acts as a retentive member, the dust itself being the principal dust arresting and retaining factor for the ensuing particles of dust and dirt. In this way, the use of adhesives is avoided and the maximum load

of a cleaner or filter is multiplied many times.

"The outstanding advantages of this type of air filter are that it is impossible to clog the filter—that it does not require oil or other adhesives which have to be changed from time to time—that it has a constant effect and constant efficiency and that dust builds upon dust and does not get in the line of air flow."

The new American Blower air filter will be exhibited for the first time at the American Blower Booth of the New York Power Show.

Detachable Auger Bit



Illustration shows "Half Diamond" style detachable auger bit and inexpensive connecting socket for attaching to old augers, manufactured by the Jos. McLaughlin Co., Joliet, Ill., as described in our November issue.

The insertible cutting bit can be furnished for any diameter hole and in style needed for any mining district. It can be furnished in an exact duplicate of blacksmith bit used at any mine.

It is claimed that the detachable bit can be furnished mines at less cost than labor forging the common bit and gives a cutting service equivalent to several blacksmith sharpenings. Samples for test purposes are furnished without cost or obligation by the makers.

New General Electric Push Button Stations

A number of improved push button stations, for use with various types of industrial magnetic control, have been introduced by the General Electric Company. These cover various fields of application, each being designed to meet some special set of circumstances.

A standard dust and water-tight push button station of particular value in cement mills, coke plants, etc., is embodied in a design bearing the designations BS-8-E and BS-4-AA, "Stop" and "Run—Stop" respectively. These have silver contacts enclosed in a malleable iron box with a leather diaphragm between the buttons and holes in the cover, the pressure on the leather diaphragm operating the switch.

Where it is necessary to have contacts immersed in oil to minimize the danger of explosions or to prevent corrosion of the copper contacts, the "Stop" and "Start—Stop" stations bearing the designations BS-11-CL and BS-12-DK are

recommended. These are specially designed to allow easy removal of the tank for filling with oil.

Another form is a standard three-button station designated BS-73 and developed as an inexpensive device for light duty without plugging. This is recommended for window opening service, valve control, operating dumb waiters, etc. Three forms are available: (a) with buttons marked "Forward," "Reverse" and "Stop"; (b) with markings "Raise," "Lower" and "Stop," and (c) marked "Open," "Close" and "Stop."

A push button station provided with protected indicating lamp is covered by types BS-11-DP, BS-12-HV and BS-12-HW. Eighteen-volt, resistance type lamps are used, instead of the bull's-eye, 115-volt type, improved protection being provided by the resistor which always limits the control current to a safe value for the contacts. The three types cover "Stop," "Start—Stop" and "Fast—Slow" markings and are standardized for 125 volts, although stations for any other standard voltage can be supplied.

An improved line of stations for back-of-panel mounting where the front is to be flush with the front of the base has also been announced. Examples are the BS-11-DG ("Stop") and BS-12-FR ("Start—Stop") forms, designed for mounting on any base between one and one and one-half inches thick. In mounting the new stations, a cover can be removed after mounting in order that connections can be made as desired.

New G. E. Automatic Welder

A new design of automatic arc welder has been introduced by the General Electric Company. With this equipment, the operator needs but to push a button to start the sequence of operations which produce the weld without any further effort or skill on his part.

The new welder starts the arc by first touching the electrode to the work and then withdrawing it, thereafter maintaining a constant arc length by feeding the electrode wire to the weld at the exact rate of speed necessary to replace the electrode fused into the weld. It is claimed that the new equipment will perform these operations more rapidly and with a greater degree of accuracy than is possible by the most expert hand operators.

How to Uncoil or Unreel Wire Rope

Directions for uncoiling wire rope are, according to the American Cable Co., as follows:

"Wire rope is ordinarily shipped and received either in coils or on reels. When uncoiling or unreeling wire rope it is

very essential that no kinks are allowed to form. Once a kink is made no amount of twisting or strain can take it out and the rope is unsafe for work. Never uncoil a wire rope as might be done with a rubber hose or manila hemp rope. Lift the coil to its edge and unroll the coil, allowing the rope to lie flat until used.

"When wire rope is received on a reel it must never be taken off or unreel, for such a method will invariably develop kinks and spoil the rope. If a jack-bracket for the reel is unavailable turn the reel on edge and roll along the ground.

How to Measure Wire Rope

According to the American Cable Co., there is only one correct way to measure wire rope. They further state:

"It is highly important that the proper size of rope be employed since an undersized rope will not give the degree of service that should reasonably be expected, while an over-sized rope represents needless investment. More important, however, is to have the rope and the sheave properly fitted. No wire rope should be allowed to travel over a sheave wherein the groove is too small for the diameter of the rope. A pinching groove will do more damage to a wire rope in one hour than a properly sized groove in an entire week or more. Sheaves grooved one-sixteenth of an inch larger than the diameter of the rope will lengthen the life of the rope many times as compared with rope life on pinching sheaves. Since sheaves are cheaper than good wire rope, there is small economy in continuing the operation of improperly grooved sheaves or drums.

"Tread diameter of drums or sheaves also greatly effects wire rope life. Wherever possible, large diameter sheaves should be used, for the bending stresses are thereby reduced. Reverse bends should also be eliminated where possible since such reverse bending is wont to greatly diminish rope service."

Wedge Wire Screen

American Rheolaveur Corporation has just negotiated a contract with the British Wedge Wire Co., Ltd., of England, to handle their products in the United States.

The principal product which is of interest to the mining industry is the wedge wire screen which is especially adaptable to dewatering. This is accounted for by the particular method of its construction.

This screen is not primarily a sizing screen, but is used principally in anthracite and bituminous coal washing plants for dewatering.

Link-Belt Increases Horse Power Range of Stock Drives

As a result of demand from the trade, the Link-Belt Company, it has been announced, has extended the horsepower range of Link-Belt Silent Chain Drives available from distributors' stocks, from its present scale of $\frac{1}{2}$ to 10 horsepower, in practically any reduction from 1 to 1 up to 7 to 1. The step-up to 15 horse power is the first change made by the Link-Belt Company in the original plan of Stock Drives Distribution, but does not, in any way, interfere with engineering drives which this company has furnished for over 20 years, up to and above 1 000 horsepower.

Reductions in Prices of General Electric Motors

A reduction in prices on its general purpose motors, amounting to 5 percent on most lines and 10 percent on commonly used sizes of squirrel cage induction motors, has been announced by the General Electric Co., effective December 1, 1926.

The motors affected by the new price levels include a-c. and d-c., constant and variable speed general purpose motors, from 1 to 200 horsepower.

Prices of standard squirrel cage induction motors have now been brought by the company to a level within about 10 percent of that in 1914.

Coincident with this reduction in prices, the General Electric Co. has announced a unified schedule of discounts for different classes of purchasers. The discount for quantity purchased at one time, on one firm order, has been made uniform on a sliding schedule for all classes of buyers.

These reductions have been made possible by improved manufacturing processes and quantity production, the company stated in announcing the new prices.

Westinghouse Switching Equipment Orders

The Westinghouse Electric and Manufacturing Company has recently received orders for switching equipment from the Southern Pacific Railroad. The Atlantic City Electric Company, and the International Oregon and Smelting Company. The Southern Pacific Railroad order includes a switchboard of 16 panels for the Moore Dry Dock at Oakland, Calif., and will be used on 250-volt service. This order also included nine type CL and CH carbon circuit breakers. The order received from the International Oregon and Smelting Company calls for a switchboard, outdoor substation structure and lightning arresters. The Atlantic City Electric Company order includes four type 0-331 oil circuit breakers.

Transformer Prices Reduced

The General Electric Company has announced a reduction averaging 5 per cent in the prices of distribution and small power transformers, 500 kv-a. and less, 73,000 volts and below, effective November 8. The reduction is in line with the policy of the company in giving the trade the benefit of economics resulting from improved engineering and manufacturing methods and quantity production. This is the fifth reduction that has been made by the General Electric Company on this class of material since 1920.

The Rubber Products Division of the du Pont Company states that there has been a steady increase in the use of Ventube and other flexible canvas tubings treated with rubber in mines during the past few years. In 1923 approximately 407,000 feet of such tubing was used in mining; in 1925, the amount had reached approximately 486,000 feet; and for 1926, it is estimated that 500,000 feet will be used.

Timken Company Gets Order For Railroad Bearings

Announcement was made recently that the Timken Roller Bearing Co. has obtained the order for the bearings for 127 railroad cars for the Chicago, Milwaukee & St. Paul Railroad. These cars will all be used on the two crack trains of the railroad, one the Pioneer Limited, running between Chicago and Minneapolis, and the other, the Olympian, running from Chicago to Tacoma and Seattle. The equipment for the Olympian will consist of nine trains, one each day, each way. The equipment for the Pioneer Limited will consist of three trains.

Link-Belt Co. has opened a new office and has established temporary headquarters at 152 Temple Street, New Haven, Conn. R. H. Hagner, formerly of the Philadelphia office, will be Link-Belt's representative in this, their thirty-sixth office, which will be devoted especially to the sale of Link-Belt Silent Chain and Link-Belt Roller Chain.

Pittsburgh & Conneaut Dock Co. to Put Second Electric Car Dumper on Great Lakes

The progress of car-dumper electrification on the Great Lakes is indicated by the decision of the Pittsburgh & Conneaut Dock Co. to electrify the fastest steam-driven dumper now on the Lakes, located at Conneaut, Ohio. This will be the second electrically operated dumper on the Lakes, the first being the T. & O. C. dumper recently completed at Toledo. The new dumper at Conneaut will be the first electrification in this country of an existing steam-driven car dumper of the lifting type.

The present dumper is a McMyler-Interstate machine unloading cars up to 100-ton capacity loaded with coal shipped over the B. & L. E. R. R. for Great Lakes ports. With the change over to electricity a reduction in operating expense and an increase in efficiency are expected. Cars containing 70 tons of coal each will be dumped at the rate of 50 per hour.

The electrical equipment will be furnished by the General Electric Co., including a motor generator, motors and control. The motor generator will be rated 1125 kilowatts and will be of the four-unit type. It will change the alternating current supply to direct current at the proper voltages.

The dumper cradle will be driven by two 450-horsepower shunt-wound, mill-type motors governed by the Ward-Leonard method of control either from the "mule" operator's house or the chute operator's house. Suitable protection will be provided, in the form of a transfer switch, to prevent the operation of the cradle from more than one point at a time. The "mule" will be driven by a single 450-horsepower, shunt-wound, mill-type motor controlled from the "mule" operator's house by the Ward-Leonard method.

The change over to electric drive is being supervised by the Hulett Engineering Co., consulting engineers, of Cleveland.

Westinghouse Opens Fairmont Service Shop

The Fairmont Service Shop of the Westinghouse Electric and Manufacturing Company, which will handle repairs on all electrical apparatus, particularly industrial and mine motors, was opened recently, in charge of R. M. Bayle, service manager.

This shop, located at Fairmont, W. Va., has a shop floor space of 3,200 square feet, 3,000 square feet of storage, 800 square feet office space and 1,000 square feet space for heating plant, garage, and scrap and rough material storage.

The equipment in this station includes a 19 inch by 38 inch by 14 feet lathe and a 24 inch banding lathe; a coil puller and a coil winding machine; a 200-ton press; a drill press, a commutator slotting machine, an electric oven; A. C. and D. C. Test board capacity 25 kv-a. A. C. and 20 kw. D. C.; two 200 gallon dip tanks; 40 inch insulation shear, 10,000 volt test set, armature testing set, oil testing set, and an armature drop test set.

Allis-Chalmers Mfg. Co. announces the appointment of Mr. Ernest Smith as Sales Engineer in the Oruro, Bolivia, office. This is a branch of the company's district office at Santiago, Chile.

Allis-Chalmers Mfg. Co. is opening a branch office in Jackson, Mich., with Mr. L. F. Berry as resident representative. This office, located at 512 Reynolds Building, Jackson, is a branch of the company's office in Detroit, which is under the direction of Mr. F. S. Schuyler as District Manager.

Robinson Ventilating Company have announced a change in their main offices at Zelienople, Pa. Carpenter and Byrne, house building, Pittsburgh, will be their Pittsburgh representatives.

General Electric Appointment

Burton L. Delack, assistant manager of the Erie, Pa., works of the General Electric Co., has been appointed assistant manager of the Schenectady, N. Y., works, effective December 1, 1926. At the same time, John St. Lawrence, general superintendent at Erie, has been named to succeed Mr. Delack there.

Two Important Changes in Westinghouse Engineering Department

Two important changes have been made in the Engineering Department of the Westinghouse Electric and Manufacturing Company according to an announcement by Mr. R. S. Feicht, Director of Engineering. Mr. R. E. Hellmund, formerly Engineering Supervisor of Development, has been appointed to the newly created office of Chief Electrical Engineer, and Mr. A. M. Dudley, formerly manager Automotive Equipment Engineering Department, has been appointed Engineering Supervisor of Development, the position left vacant by Mr. Hellmund's promotion.

Mr. Feicht's announcement outlines Mr. Hellmund's activities in his new position, which will be principally in connection with electrical development work to assure the adequacy and progressiveness of designs and to properly coordinate this work throughout the different engineering departments. He will continue to serve as chairman of the Engineering Educational Committee, and will also retain his connection with the Supervisory Group on Development and the Patent Board.

In the capacity of Engineering Supervisor of Development Mr. Dudley will be responsible for all central activities of the Engineering Department in connection with the development budget and program of the Electrical Group. He will continue to act as Secretary of the Engineering Educational Committee and Secretary of the Supervisory Group on Development.

Ohio Brass Co. Moves California Offices

Effective November 1, the Ohio Brass Co. has established new quarters for its San Francisco and Los Angeles branch offices.

The new address of the San Francisco office is Rooms 531-532-533 Matson Building, 215 Market Street; telephone No. Davenport 9383.

The Los Angeles office location is Room 508, Subway Terminal Building, 417 S. Hill Street; telephone No. Mutual 3506.

In both of these cities the company will continue to carry ample stock of its various products for the convenience of the western trade.

Robert J. Anderson, Inc., Chemists, Metallurgists and Consulting Engineers, have announced the opening of new commercial testing laboratories, modern in every detail. Chemical analyses, mechanical tests, metallography and radiology of metals; aluminum metallurgy a specialty. 2416-38 Beekman Street, Cincinnati, Ohio.

Mine Safety Appliances Company, Pittsburgh, has issued a bulletin, No. 211, on the M. S. A. rock dust distributor. The bulletin is thoroughly illustrated with half tones and diagrams giving complete information concerning mines that should be rock dusted, kinds of dust to be used, size of dust, and parts of mine to be rock dusted.

Foot Bros. Gear and Machine Company, 215 North Curtis Street, Chicago, has just published a new catalog concerning their line of continuous tooth herringbone speed reducers, single, double and triple reduction. Copies of the bulletin may be obtained upon addressing their Chicago office.

Coppus Engineering Corporation, Worcester, Mass., has issued a bulletin, No. 122, on Vano and Ventair Blowers and Exhausters for mine ventilation. This particular bulletin gives special information concerning the electric motor drive, and their figures concerning horse power are particularly interesting. Copies of the bulletin may be had upon request to the Worcester office.

The Carnegie Steel Company, Pittsburgh, has issued a very comprehensive book on Wrought Steel Wheels and Forged Steel Axles, giving data tables, and specifications pertaining to designs. Items of interest to the mining industry are the chapters on wrought steel wheels, mine locomotive wheels, industrial and mine car wheels. The book is profusely illustrated with diagrams, and comprehensive tables are given covering all specifications. Copies may be had by addressing the Pittsburgh office.

Rock Drill Steel Sharpeners

A new catalogue No. 72-J, describing the latest type of Sullivan All Hammer Compressed Air Drill Sharpener for heavy duty in mines, quarries and on contracts wherever rock drill steel is used, has just been issued by the Sullivan Machinery Company.

The new catalogue shows various improvements including a new design of frame which is more compact and lighter than the old one, a new retracting hollow steel punch and new gauging devices for making the double taper bits, now so frequently and effectively used to increase drilling speed.

The new and revised edition of the Cameron Single-Stage, Double-Suction, Volute Pump Bulletin, Form No. 7059, just released by The Ingersoll-Rand Co., contains information of special interest to users of centrifugal pumps. The bulletin is fully illustrated and may be obtained upon request to the company's New York office, No. 11 Broadway.

Combustion Engineering Corporation, 43 Broad Street, New York City, has just issued a new catalogue on Raymond Roller Mills. This catalogue is particularly interesting, because, for the first time, it describes in detail the new Raymond Pneumatic Feed Control which has been applied to all Raymond Roller Mills. According to their release, the entire action of this control is pneumatic and the only movements which take place in the mechanism are the opening and closing of two small valves in the controller, and the collapsing and inflation of the diaphragm of the pawl-lifting mechanism.

The Explosives Service Bulletin for October, published by E. I. DuPont de Nemours & Company, Inc., Wilmington, Del., is somewhat different from others. It treats of "The Use of Explosives Underground as Giving Rise to Carbon Monoxide and Oxides of Nitrogen Poisoning" with a discussion of the symptoms, first aid, and treatment. The authors are the Medical Directors of the DuPont Company, Dr. G. H. Gehrman, and Mr. W. H. Ward of the Chemical Division of the Explosives Department.

FLOTATION PROCESS DEVELOPS RAPIDLY

The total quantity of ore reported to the Bureau of Mines, as being treated by flotation in 1925 was 45,490,331 tons, from which 2,790,526 tons of concentrates were obtained. Returns were received from operators whose output represents probably 98 or 99 per cent of the total amount of ores treated by the flotation process. The quantity of reagents consumed was 81,666,967 pounds.

Sulphuric acid, of which 40,028,170 pounds were used, was the most popular reagent. Large quantities of reconstructed oils, sodium and barium sulphide and calcium polysulphide, pine oil, xanthate, lime, refined coal tar oils, hardwood creosotes, soda ash, copper sulphate and zinc sulphate were also used.

Flotation has developed rapidly and on a more scientific basis than ever before, states Thomas Varley, metallurgist, Bureau of Mines, in a summary of the situation. Perhaps more fundamental and useful data have been uncovered during the past two years than in all the years the art has been practiced.

The Bureau of Mines at its Intermountain Experiment Station, Salt Lake City, Utah, in cooperation with the Department of Metallurgical Research, University of Utah, has followed a definite program on flotation fundamentals based on the use of pure minerals—pure gangue materials and soluble constituents common in ores.

Cooperative work of the Bureau of Mines and a commercial chemical concern has also made known for the first time the definite and positive action of various chemicals on the surfaces of various sulphide minerals. Cyanide compounds alone and in conjunction with other chemicals have been studied. The work has had a ready application in flotation plants.

In past years flotation has been referred to generally as "oil flotation"—today it might be more properly called "chemical flotation." Minerals can be floated today without oil. Chemicals alone will do the work, showing how little was truly known about the process heretofore. The term "reagents" as used by the Bureau of Mines, includes both chemicals and oils.

Another outstanding feature regarding the use of flotation reagents is the radical drop in "pounds per ton" of reagent used in 1925 as against 1924. The figure for 1923 was 4.2680 pounds of total reagents per ton of ore treated, for 1924 it was 3.9618 pounds, and for 1925 it was 1.7952 pounds per ton of ore treated.

The principal reason for this decrease in amount required to treat a ton of ore, is that crude oils, heavy oils and acids have practically been eliminated. Smaller amounts of refined coal-tar oils, wood creosotes, pine oils, and some reconstructed oils constitute the greater bulk of oils used—these being used principally as frothers, and in small amounts averaging very close to 0.07 pound per ton of ore treated. Chemicals, many under trade names such as xanthate, T & T (a mixture of orthotoluidine and thiocarbonyl), X-Y mixtures and others, are generally used. For differential flotation cyanide, zinc

sulphate, copper sulphate, etc., are largely used as either depressing or accelerating reagents.

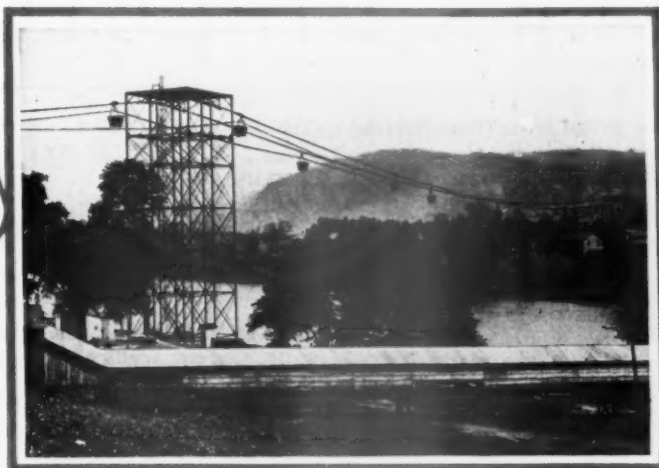
In order to counteract objectionable soluble materials present either in the ore or the mill water, modifying reagents are used to "condition the pulp" and by neutralization prevent interference of such soluble materials. Reagents of this type are soda ash, sodium silicate, sodium sulphite, crude soda, lime and acids. In this connection, lime is generally regarded as a "chemical," on account of its action on the minerals, and its reactions with acidic solutions or soluble salts in the ore.

The year 1925 saw the passing from acid to alkaline circuits. Chemical flotation agents and conditioning agents have proved far more effective when used in alkaline pulps. Lime, as compared with acid, is much cheaper, and can be handled and stored much more easily and safely than acid. Lime can be manufactured in almost any locality, and procured more readily than acid. Nearly all big operators have their own lime plants now and several are manufacturing their own reagents.

The relative floatability under a standard set of conditions has been determined for most sulphide minerals, also for some of the more common gangue constituents such as silica, siliceous materials free from mineral, calcite, limestone and others. Chemicals seem to have a positive action on minerals—really a different action on each, and it is this fact that is taken advantage of in differential flotation work. Different oils have a slightly different action on the flotation of different minerals and thus assist the chemicals.

The ratio of concentration in flotation is comparatively high because high-grade products are constantly being obtained more free from undesirable minerals and gangue than heretofore. In 1925, an average concentration ratio of 16.301 tons of ore into 1 ton of concentrates was attained. This ratio is much less than that for the 1924 figures, which was 19.626 to 1, and is lower than that for 1923, which was 17.730 to 1. The low average ratio for 1925 is partly due to the increased tonnage of lead-zinc-iron ores treated. Some of these ores are more than 50 per cent mineral, and by the removal of three concentrates—namely, lead, zinc and iron products—the concentration ratio is reduced materially. Copper ores, of which 46,175,198 tons were treated by flotation in 1925, constituted the great bulk of ore so treated.

Detailed information in regard to the consumption of reagents used in flotation in 1925 is contained in Serial 2777, copies of which may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.



This is a section of the Leschen Aerial Tramway referred to in the letter below. It is actually delivering more coal than specified in the purchase contract

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THE LETTER

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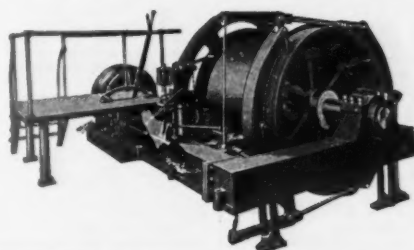
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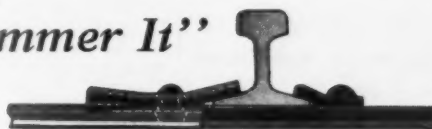
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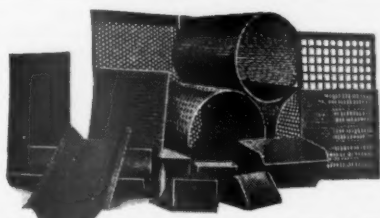
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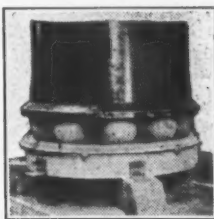
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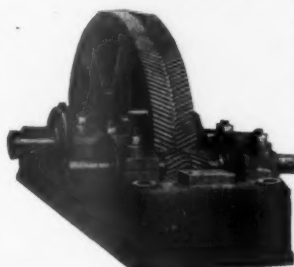
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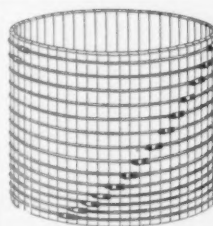
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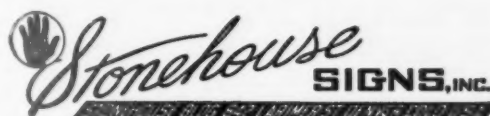
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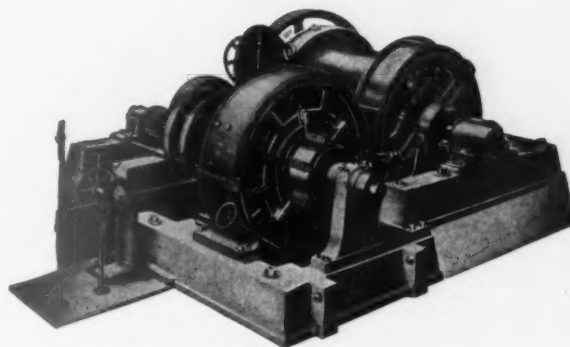
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INDEX TO ADVERTISERS

	Page		Page
Allis-Chalmers Manufacturing Co.....	17	Hoffman Bros.....	39
Ameling Prospecting Co., Inc., H. R.....	39	Howells Mining Drill Co.....	41
American Steel & Wire Co.....	37	Hyatt Roller Bearing Co.....	Front Cover
Atlas Powder Co.....	30	Ingersoll-Rand Co.....	19
Baverstock & Payne.....	41	(Cameron Steam Pump Works)	
Boyle, John, Jr.....	43	Irrington Smelting & Refining Works.....	41
Byers Co., A. M.....	31	Jeffrey Manufacturing Co.....	5, 6, 7, 8
Cameron Steam Pump Works.....	19	Keystone Churn Drill Co.....	39
(Ingersoll-Rand Co.)		Keystone Lubricating Co.....	25
Cement-Gun Co., Inc.....	26	Knox Manufacturing Co.....	Inside Front Cover
Central Frog & Switch Co., The.....	21	Lehigh Coal & Navigation Co.....	45
Concordia Electric Co.....	26	Leschen & Sons Rope Co., A.....	33
Connellsville Manufacturing & Mine Supply Co.....	43	Linde Air Products Co.....	35
Conveyor Sales Co., Inc.....	32	Link-Belt Co.....	51, 52, 53, 54
Copper & Brass Research Assn.....	27	McLaughlin Co., Jos.....	16
Coppus Engineering Corp.....	28	Mining Safety Device Co., The.....	41
Diamond Machine Co.....	23	Morse Chain Co.....	Back Cover
Dorr Co., The.....	22	Mott Core Drilling Co.....	39
Dravo-Doyle Co.....	28	Ohio Brass Co.....	12-13
Du Pont de Nemours & Co., Inc., E. I.....	29	Pacific Tank & Pipe Co.....	41
Ellis Mill Co.....	41	Patrick, R. S.....	37
Enterprise Wheel & Car Corporation.....	37	Phelps Dodge Corporation.....	41
Fawcus Machine Co.....	41	Robinson Ventilating Co.....	30
Flory Manufacturing Co., S.....	39	Roebbling's Sons Co., John A.....	14
General Coal Co.....	47	Stonehouse Signs, Inc.....	43
General Electric Co.....	10-11	Texas Gulf Sulphur Co.....	20
Golden Rod Mining & Smelting Corp.....	43	Thorne Neale & Co., Inc.....	45
Goodman Manufacturing Co.....	15	Timken Roller Bearing Co., The.....	9
Hendrick Manufacturing Co.....	41	United Filters Corporation.....	18
Hercules Powder Co.....	3	Vulcan Iron Works.....	24
		West Virginia Rail Co.....	39

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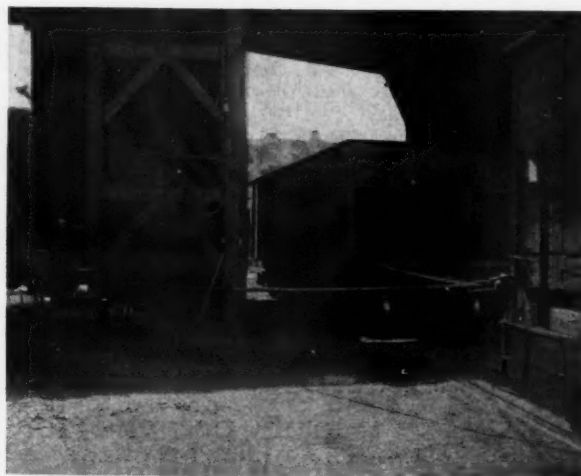


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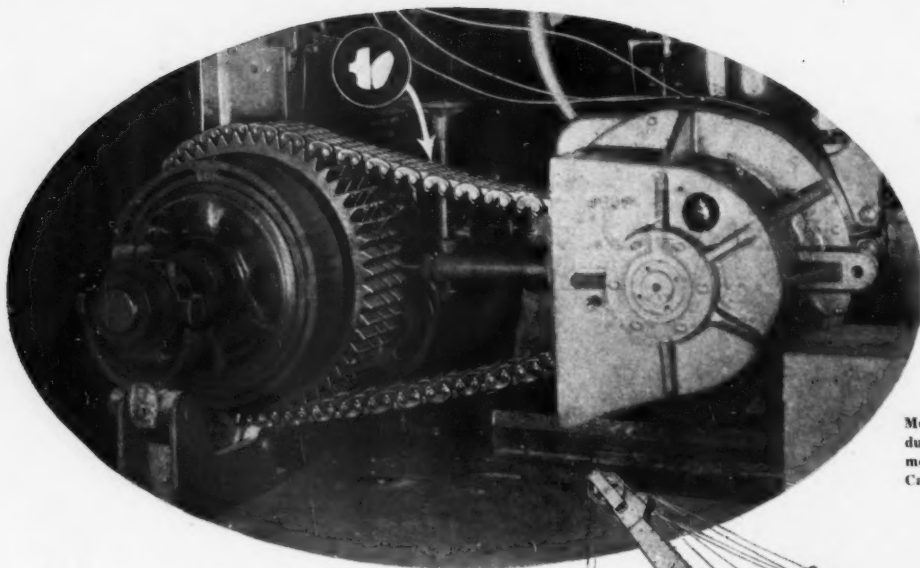
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